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Refugees and Humanitarian Aid

The Rohingya Impact on Bangladesh's Development

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Abstract

This paper examines the impact of refugee camp hosting on local communities, specifically the Rohingya crisis in Cox's Bazar, Bangladesh. It uses remote sensing measurements and panel data to compare areas and individuals at varying distances before and after the Rohingya arrived. The results highlight the complex dynamics of areas that host displaced populations. The paper finds that when the proximity of a grid to the refugee camps increases by 30 km (18.6 miles), night light density rises by 1.7 percent and deforestation expands by 0.02 percent. Land use results align with these findings, showing a decline in dense-open forest and an increase in land covered by grass and crops. The analysis of individual-level data suggests that the Rohingya's presence manifests in higher job formality, better access to aid, and more food consumption—all largely attributable to the activities of humanitarian organizations. However, their presence is also associated with heightened safety concerns and a higher prevalence of viral diseases such as diarrhea, fever, and cough.

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Refugees and Humanitarian Aid: The Rohingya Impact on Bangladesh's Development*

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I INTRODUCTION

As of 2023, there were an estimated 45 million refugees globally, with the majority seeking refuge in middle- and low-income countries (UNHCR 2023b). Despite considerable efforts by these nations to host and support displaced populations, their capacity and will to do so are often limited by insufficient resources and concerns about potential impacts on their own vulnerable communities. Therefore, high-quality knowledge about the comprehensive effects of hosting displaced populations would benefit these processes.

This study enhances the policy debate by examining the broad socioeconomic consequences of hosting the displaced Rohingya population in the Cox's Bazar area of Bangladesh. Prior research on this topic has investigated the effects of refugee camps on specific outcomes.[1] Nonetheless, this study stands out for its in-depth assessment of the comprehensive socioeconomic effects of refugee camps on nearby communities in a context where forcibly displaced populations are confined to camps and thus entirely reliant on humanitarian aid. This focus provides a unique perspective on the dynamics between refugee camps, humanitarian aid, and host communities.

The displaced Rohingya population in Cox's Bazar can be broadly categorized into two groups: those who arrived around or before the 1990s and those who arrived after 2017. By the end of December 2023, nearly one million Rohingya were registered in 33 camps in Cox's Bazar, comprising 35,519 who arrived in the 1990s and 716,915 who fled to Bangladesh (UNHCR 2018) following severe military attacks against the Rohingya community in Myanmar in August 2017. This event marked the largest and fastest forced migration episode in Asia since the Vietnam War. Despite the Bangladesh government's provision of land for the 33 camps in Cox's Bazar, concerns regarding security and the potential impact on local communities have restricted the Rohingya's mobility and employment outside the camps. Consequently, they rely entirely on humanitarian aid.

This study employs a difference-in-differences methodology to examine the development effects of proximity to refugee camps, comparing locations near and far from the camps before and after the 2017 Rohingya influx. As shown in Figure 1, the grids were com-

[1] See Montalvo and Reynal-Querol (2007) and Alix-Garcia et al. (2018) for notable examples.

parable before the influx, and night light density increased after the Rohingya arrived in Bangladesh. We calculate the distance to the camps as a weighted average, considering each individual's or area's distance to each of 33 camps with weights based on each camp's population. This approach enables a nuanced comparison between individuals living closer to and farther from the most populated camps in Cox's Bazar both before and after the Rohingya arrived.

We use two distinct data sources to investigate the impact of refugee camps on local communities in Cox's Bazar. First, the study incorporates annual grid-level remote sensing data that tracks night light density as a proxy for economic growth, deforestation, and land use (including grassland, cropped areas, and dense-open forest). We use this data to assess the development effects of the Rohingya's presence on individuals living around each of the 33 refugee camps. The analysis addresses a grid level of one square kilometer, encompassing the 2,392 cells observed annually from 1992 to 2021 in Cox's Bazar.

The second data source is the Cox's Bazar Panel Survey, conducted in 2019 and 2023 after the arrival of the displaced Rohingya. This data represents the Rohingya population plus non-Rohingya individuals living outside the refugee camps. Since data collection began after the Rohingya arrived, only distance to the camps is used to assess the impact on individual outcomes. We enhance our analysis by incorporating survey fixed effects, leveraging the longitudinal nature of the data.

We find that hosting displaced populations in camps produces complex mixed effects on nearby hosting communities. The study reveals that the influx of displaced Rohingya and the subsequent humanitarian aid prompted greater night light density and more deforestation. The increments in night light density, however, are substantially greater than the gains in deforestation. Specifically, the results suggest that when the proximity of a grid to the refugee camps increases by 30 km (18.6 miles), night light density increases by 1.7 percent and deforestation increases by 0.02 percent. Considering that a one percentage point (pp) change in night light density corresponds to a 0.28 pp change in GDP (Henderson, Storeygard and Weil 2012), grid areas 30 km closer to the camps had approximately 0.5 percent higher GDP (1.7×0.28 = 0.47) than grids farther away.

These observations align with results derived from land use data. Specifically, after the Rohingya arrived, areas closer to the camps experienced a decrease in dense-open forests and an increase in land covered by grass and crops, compared to the period before 2017. The consistency of the raw data trends supports the validity of the parallel trends assumption.[2] Furthermore, the findings remain robust when we control for differential linear pre-trends between the treatment and control groups. These effects are also visually evident in map illustrations depicting changes in the areas around the camps.

We also analyzed the impacts of proximity of host-community individuals to the refugee camps on several groups of outcomes including adult and household welfare (wealth, income, expenditures, food consumption, and assistance); labor markets; public services (health and education); safety perceptions; and host attitudes toward the Rohingya. These estimates include multiple hypotheses-testing corrections considering the large number of outcomes evaluated.

The findings suggest that the welfare effects of camp proximity on adults and households in host communities are limited and mostly related to humanitarian aid. Particularly, when the distance between the individuals and the camps decreases by 30 km, the likelihood of receiving humanitarian food aid increases by 8.2 pp, the likelihood of receiving food in-kind increases by 5.5 pp, and the likelihood of receiving assistance in the form of household items increases by 10.6 pp. The results do not allow us to distinguish statistically significant effects on wealth, income, or expenditures.

The findings related to labor market outcomes suggest that when the weighted distance from an individual to the refugee camps drops by approximately 30 km, the likelihood of having a written contract increases by 4.6 pp. These are large effects, representing deviations from the mean of 33 percent. Unsurprisingly, the results also suggest a higher likelihood of employment by nongovernmental organizations (NGOs, likely represented by humanitarian organizations) and reductions in employment by all other employers.

[2]The parallel trends assumption posits that the treatment and control groups must exhibit similar trends in the absence of the treatment under study. This assumption is crucial for accurate estimation in difference-in-differences analysis. The parallel trends assumption is verified graphically by plotting the outcome variable for both groups over time, both before and after the treatment.

Regarding health impacts, individuals who live closer to the camps have a higher probability of contracting viral diseases than those who live farther from the camps. Estimates indicate that a decrease in distance to refugee camps by 30 km is associated with a 2.1 pp increase in the likelihood of experiencing diarrhea, a 3.7 pp increase in the likelihood of experiencing fever, and a 2.7 pp increase in the likelihood of experiencing a cough. Additionally, individuals closer to refugee camps are more likely to seek health care from NGO providers. These results are in line with those documented by Dagnelie, Mayda and Maystadt (2023), who use DHS data to examine the effects of 30 refugee camps in Africa. The authors report negative effects on height-for-age and weight-for-age scores of children under five years of age and suggest that the effects stem from heightened rates of malaria transmission. Importantly, this mediating factor might also affect our context as Zhao et al. (2023) note that Myanmar bore the heaviest malaria burden in the Greater Mekong subregion between 2011 and 2017.

Greater proximity to refugee camps is also evident in heightened self-reported safety concerns. The estimates indicate that an increase in proximity to the camps by 30 km is associated with a higher likelihood of experiencing serious injuries by 2.6 pp, encountering combat situations by 2.1 pp, facing near-death experiences by one pp, and witnessing homicides of strangers (one pp). These correspond to large and meaningful effects that represent increments of at least 20 percent in the mean values of these outcomes. The results underscore unease about the effects of proximity to refugee camps on the safety and security of individuals in surrounding areas.

Finally, a decrease in distance to the camps is associated with more positive perceptions among hosts regarding the benefits their families receive from the presence of the Rohingya. Additionally, those living closer to the camps are less likely to believe that support for camp residents should come only from external sources. However, respondents nearer the camps are also more worried about safety due to the Rohingya's presence.

Overall, the individual-level analysis suggests complex but extremely consistent effects of the Rohingya refugee camps on host communities. The positive effects of closer proximity to these camps are all associated with the presence of humanitarian institutions: individ-

uals closer to the camps have higher food consumption and variety plus more demand for formal jobs and better service provision (in the form of aid). Yet, closer proximity to refugee camps is associated with an increased probability of contracting viral diseases and heightened safety concerns among host communities.

From a policy perspective, our results suggest that hosting displaced individuals in camps while minimizing their local economic integration spurs economic effects that are largely limited to support received from humanitarian aid and direct demand generated by camp residents and humanitarian workers. However, considering the constant advent of new conflicts worldwide and the financial constraints associated with funding protracted refugee crises, a hosting approach that depends entirely on humanitarian aid is financially unsustainable in the medium to long term. Moreover, limiting refugees' access to work-related income opportunities may significantly exacerbate their vulnerability and explain the documented safety and health risks surrounding camps, which are likely to worsen as new generations grow up amid limited opportunities. A more sustainable and development-oriented policy could emerge from gradually allowing forced migrants to generate their own income and—with time—to gain self-reliance.

This paper primarily contributes to the literature that examines the effects of refugee camps on host communities. The evidence indicates that refugee camps exert complex and varied effects on these communities, influenced by the policies in place for hosting displaced individuals and the degree of access to services and labor granted to them. Key findings highlight that refugee camps can lead to negative impacts, including an increased prevalence of malaria and other contagious diseases (Montalvo and Reynal-Querol 2007; Dagnelie, Mayda and Maystadt 2023), deterioration in children's health outcomes such as anthropometrics, higher rates of infectious diseases, infant mortality, lower educational attainment (Baez 2011; Dagnelie, Mayda and Maystadt 2023; Ozden et al. 2022; Anti and Salemi 2021), and slight increases in deforestation (Salemi 2021; Maystadt et al. 2020).

However, the literature also records several positive effects of refugee camps. These include increased night light density, employment, and consumption (Alix-Garcia et al.

2018); higher agricultural prices (Alix-Garcia and Saah 2010); improved employment opportunities, particularly outside subsistence farming and in wage employment; and more prevalent asset ownership (Loschmann, Bilgili and Siegel 2019). Additionally, mixed welfare effects are observed, with the impacts varying by occupation, resulting in both winners and losers (Maystadt and Verwimp 2014).

Studies focusing on the Global South have further documented positive impacts of hosting refugees in camps on the political views of host communities, which are linked to the effects of international aid on local public services (Zhou and Grossman 2021). The paper most closely related to this study is Davis et al. (2024), who use the 2019 Cox's Bazar Panel Survey to document that hosting responsibilities for the displaced Rohingya people in Bangladesh are allocated in unequal fashion. Particularly, they show that refugee camps are placed in socioeconomically disadvantaged communities relative to both surrounding areas and Bangladesh as a whole.

This paper advances the literature by investigating the local development effects of hosting displaced populations in refugee camps. Our analysis leverages unique grid-level satellite data and two waves of a longitudinal study that is representative of individuals living in close proximity to the camps. This context offers a distinctive scenario where the displaced population is highly restricted, with individuals predominantly confined to camps and completely dependent on humanitarian aid. Thus we shed light on the consequences of hosting refugees within camps with minimal interaction between the displaced population and the local community in a developing country that itself relies heavily on humanitarian aid.

The rest of the paper is structured in four sections. Section II describes the displaced Rohingya population and their current situation in Bangladesh. Section III describes the empirical strategy, including the data and identification strategy. Sections IV and V discuss the results: the impacts of camps on night light density, deforestation, and individual-level outcomes. The last section offers some concluding remarks.

II CONTEXT: THE DISPLACED ROHINGYA POPULATION IN BANGLADESH

The Rohingya people in Myanmar's Rakhine State. The Rohingya, a Muslim ethnic minority, lived for centuries in the predominantly Buddhist region now known as Myanmar, formerly Burma (Reid 2023). Despite their long history in this territory, the Rohingya are not officially recognized as an ethnic group and have been without citizenship since 1982 according to Myanmar's law, making them one of the largest stateless groups globally (UNHCR 2023b). In Myanmar, the Rohingya historically faced significant violence, discrimination, and persecution. Since the 1970s, they have been considered one of the most persecuted minorities worldwide. Before the 2017 crisis, the Rohingya population in Myanmar was close to 1.4 million individuals.

Crisis of 2017. In August 2017, multiple violent attacks occurred in Myanmar for which the Arakan Rohingya Salvation Army (ARSA) claimed responsibility. They included the assassinations of 12 Myanmar security officers, pre-dawn raids on police posts, and attempts to breach a military base. In response, the Myanmar government declared ARSA a terrorist organization and launched a radical, extremely violent military campaign that destroyed hundreds of Rohingya villages. Reports said Myanmar's security forces not only opened fire on fleeing civilians—killing tens of thousands of innocents—but also planted land mines near border crossings used by the Rohingya to escape to Bangladesh (CFR 2020). Moreover, other human rights violations were widespread (Amnesty 2017). The violence triggered the largest exodus of the Rohingya since the Vietnam War. According to UNHCR (2023b), in just a matter of weeks, over 742,000 forcibly displaced individuals sought refuge in Bangladesh. The United Nations Human Rights Commissioner called the situation in Rakhine State a "textbook example" of ethnic cleansing.

Displaced Rohingya population in Bangladesh. According to UNHCR (2023b), over 960,000 Rohingya, including more than 499,000 children, have sought safety in Bangladesh. The majority have settled in the Cox's Bazar district just across the border from Myanmar, making it the world's largest complex of refugee camps. Other Rohingya fled to neighboring countries such as Thailand (92,000) and India (21,000), while smaller numbers have found refuge in Indonesia, Nepal, and other nations in the region (UNHCR 2023b).

Bangladesh has welcomed the Rohingya and made considerable efforts to host them since 1978. The conflicts in Rakhine State have triggered five major waves of Rohingya migration to Bangladesh. The first wave happened in 1978, with over 200,000 people fleeing to Cox's Bazar after reported evictions by the Myanmar military. Negotiations led to about 107,300 Rohingya returning by March 1979, totaling 180,000 returnees between 1978 and 1979 (HRW 2003). The second wave occurred in 1991–92, when an estimated 250,000 Rohingya fled Myanmar amid political turmoil and increased military presence (ACAPS 2017). Repatriation efforts started in April 1992, resulting in over 230,000 Rohingya returning to Myanmar by 1997. The third wave in 1997 resulted from high food prices and forced labor in Myanmar, with many Rohingya settling in Bangladeshi villages, making counting difficult. Repatriation briefly resumed in 1998, with around 800 Rohingya returning to Myanmar by October 1999 (HRW 2003). The fourth wave took place in October 2016 due to insurgent activity in Myanmar, with over 87,000 Rohingya settling primarily in Ukhia subdistrict and forming the Balukhali makeshift settlement (ACAPS 2017). The fifth and most significant wave occurred in August 2017, as described above.

In September 2017, Bangladesh's Disaster Management and Relief Ministry announced there would be no restrictions on Rohingya entry, ensuring shelter for as long as needed. Subsequently, the government of Bangladesh began to consolidate all Rohingya into a specific location, constructing a formal refugee camp complex in the Ukhia and Teknaf subdistricts. The complex encompasses 33 camps intended to accommodate up to 800,000 forcibly displaced individuals (ICG 2023).

As a developing nation with limited resources, Bangladesh faces the challenge of providing humanitarian aid to the Rohingya while ensuring stability and security within its borders (The Diplomat 2018). Although the Bangladesh government offered physical space to host the displaced population, it confined the majority of them to camps. The rationale behind this restriction was rooted in concerns about the security of the host population.

Only around 50,000 displaced Rohingya from earlier caseloads (pre-August 2017) have received formal recognition as refugees. This status grants them certain privileges, including the freedom to seek employment outside the camps and to engage in commercial

activities. Since Bangladesh did not sign the 1951 Convention relating to the Status of Refugees or the 1967 Protocol, the absence of a national asylum framework leaves the vast majority of refugees and asylum seekers without legal recognition (UNHCR 2018). The government of Bangladesh emphasizes voluntary repatriation as the primary solution for the Rohingya; it considers their stay to be temporary and based on humanitarian grounds. Consequently, the majority of Rohingya in Bangladesh rely entirely on humanitarian aid for protection, food, water, shelter, and health care (UNHCR 2023b).

The Rohingya now constitute one-third of the population of Cox's Bazar (UNHCR 2023b). Since 2021, the government of Bangladesh has relocated nearly 30,000 displaced individuals (on a voluntary basis) to Bhasan Char island to alleviate congestion in the camps.

Living conditions in refugee camps. The 33 Cox's Bazar refugee camps are situated in the Teknaf and Ukhia subdistricts. Their location is illustrated in Figure 3. The camps began informally in 1991 when nearly 250,000 Rohingya fled to Bangladesh following the Burmese military's Operation Pyi Thaya (USHMM 2020). However, in 1992, approximately 150,000 Rohingya in Bangladesh returned to Burma. After the tragic events of August 2017, the more than 700,000 Rohingya who sought refuge in Bangladesh significantly expanded the size of the camp complex (USHMM 2020). Currently, there are nearly 936,482 Rohingya residing in these camps (UNHCR 2023a), with the population continuing to grow due to the high number of births there.

The extensive network of camps covers an area of about 24 square km and makes Cox's Bazar one of the most densely populated areas in the world. Living conditions in the camps are characterized by overcrowding, inadequate shelter, limited sanitation facilities, scarce access to clean water, and restricted health care and other essential services. For instance, the United Nations recommends a minimum living area of 45 square meters per person in refugee camps. However, according to UNHCR, only six of the 33 camps in Cox's Bazar meet this standard, with 24 falling below a critical range of 29 square meters or less per person (Hussein and Duggal 2023). The most crowded camp provides only 12 square meters per person—equivalent to conducting all daily life chores and activities in a space of just 3.5 meters by 3.5 meters. Cramped living conditions have led to poor

sanitation and disease. According to UNHCR standards, a communal toilet should be shared by no more than 20 people during the emergency phase of a camp. However, in longer-term accommodation, one toilet should be dedicated to one family (4–6 people). Unfortunately, 19 out of 33 camps in Cox's Bazar are operating beyond the UN guidelines (Hussein and Duggal 2023). The Kutupalong refugee camp faces the most severe conditions, with each toilet shared by an average of 54 people. Moreover, clean water sources, crucial for well-being, present challenges during the monsoon season as floods and landslides render many basic facilities useless.

III EMPIRICAL STRATEGY

In this section, we describe the identification strategy and the data we use to assess the development effects of hosting the camps on the local communities in Cox's Bazar.

III.A Identification Strategy: Difference-in-Differences

We approximated the impacts of hosting the displaced Rohingya population by exploiting the distance from each geographical unit (grid) or individual's location to the camps, both before and after the crisis onset in 2017. More specifically, we employed a difference-in-differences methodology to compare the outcomes of grids and individuals that are closer to and farther from the camps, before and after 2017.

Our main specification is given by the following functional form:

$$Y_{it} = \alpha_0 + \alpha_1 \text{SID Camps}_i \times I(\text{Post 2017})_t + \gamma_i + \gamma_t + \epsilon_{it} \quad (1)$$

where i denotes one-square-kilometer grids or individuals, and t denotes year. Y_{it} represents the grid- or individual-level outcomes (described in the next section), while $I(\text{Post 2017})_t$ is an indicator variable that takes the value of one after 2017, when the massive Rohingya inflows started. γ_i and γ_t account for grid/individual and year fixed effects, respectively. Finally, ϵ_{it} is the error term. To account for time serial correlation in outcomes across geographic areas, standard errors are clustered at the grid level. In all specifications, we report the False Discovery Rate (FDR) q-values to adjust for multiple hypothesis testing.

The variable SID Camps$_i$ represents the standardized weighted inverse distance of each grid/individual to the 33 refugee camps, calculated as follows:

$$\text{SID Camps}_i = \left[\frac{1}{\sum_{j=1}^{33} (W_c \times \text{distance}_{jl})} \right] \tag{2}$$

Here, SID Camps$_i$ is the product of the inverse distance of each grid unit i to each of the 33 main refugee camps j in Cox's Bazar. The distance from each geographic unit to each refugee camp is calculated using the Euclidean distance formula, measured from the centroid of each geographic unit (or coordinate location of each individual) to the centroid of each camp. W_c represents the displaced population weights of each camp in 2023. The location of each of the 33 camp areas is illustrated in Figure 3. The standardization of SID Camps$_i$ facilitates the interpretation of results. The geographic variation of SID for the district of Cox's Bazar, where the analysis is centered, is illustrated in Figure 4.

Our main coefficient of interest is α_1. It describes the effects of increasing SID Camps by one standard deviation in each of the outcomes. In simpler terms, it describes the effects of being physically closer to the most populated refugee camps before and after the Rohingya arrived in 2017.

III.B Data

This paper combines multiple sources of information described below. All data sources are restricted to the Cox's Bazar district as it is the area most plausibly experiencing the majority of the effects of the refugee camps.

III.B.1 Remote Sensing Data

1. *Night light density*. Data on night light density comes from the Defense Meteorological Satellite Program Operational Linescan System (DMSP-OLS) and the Visible Infrared Imaging Radiometer Suite (VIIRS). The former spans 1992–2013 and the lat-

ter, 2012 to the present.[3] We use the harmonized data produced by Li et al. (2020).[4]

We clipped the night light raster files to include only Bangladesh's territory and downloaded the shapefile at the national level from the Humanitarian Data Exchange, which is managed by the Office for the Coordination of Humanitarian Affairs (OCHA). Next, the spatial coordinates, originally measured in degrees using the (WGS 84) coordinate system, were projected to the EPSG 9678 coordinate system, which enabled the measurement of coordinates in meters. As a result, we divided the entire territory into grids consisting of cells of one square kilometer. Then, since the night light density raster files were in geographic coordinates, the grid cells were projected back to WGS 84. Night light density at the grid cell was then computed by calculating the simple mean of the night light luminosity across all pixels within each grid cell. The final data was restricted to the district of Cox's Bazar and consists of an annual average measure of night light density for the period spanning 1992 to 2021 at a level of one square kilometer.

2. *Deforestation.* This study uses the collection of raster images from the Hansen Global Forest Change dataset, which is available in the Google Earth Engine database (Hansen et al. 2013). This dataset leverages Landsat images to assess and characterize global forest extent and changes over time. Specifically, it focuses on identifying forest loss, defined as the transformation of forested areas into non-forested ones due to stand-replacement disturbances. For the analysis, forest loss was computed into

[3]Despite the availability of data, both sources of night light series are inconsistent due to differences in spatial and radiometric resolution, spectral responses, the spread function of the sensors, local overpass time at night, radiance range, and on-board calibration (Li et al. 2017; Sahoo, Gupta and Srivastav 2020). Furthermore, the DMSP-OLS sensor measures night light density annually in digital numbers (DN), while the VIIRS sensor measures monthly in radiance (Gibson et al. 2021).

[4]The authors follow four steps to inter-calibrate DMSP-OLS and VIIRS sensors: DMSP-OLS calibration, the annual composition of VIIRS, and VIIRS conversion like DMSP-OLS. In the first step, the authors calibrated the stable DMSP-OLS night lights from 1992 to 2013. This calibration process aimed to ensure consistency and accuracy in the DMSP-OLS data. In the second step, the authors addressed the noise present in the VIIRS data caused by factors such as clouds, auroras, and temporary lights like fires and boats. They applied noise-removal techniques to improve the quality of the VIIRS data. In the third step, the authors converted the higher resolution of VIIRS (15 arc-seconds) to match the resolution of DMSP-OLS (30 arc-seconds) using the kernel density approach, which is similar to the method described in Li et al. (2017). This conversion ensured consistency between the two datasets. Finally, to convert the processed data into digital numbers (DN), the authors employed a sigmoid function proposed by Zhao et al. (2019). As a result, it is possible to use consistent and calibrated night light data.

each grid cell for the period 2001–2022 using the Google Earth Engine code editor.[5] The measure of forest loss is expressed in hectares per square kilometer (ha/km^2).

3. *Land use type.* The MODIS Land Cover Type dataset offers comprehensive global land cover information with yearly intervals ranging from 2001 to 2020 (Friedl et al. 2010).[6] To classify land use, the MODIS Land Cover Type dataset employs various supervised classification methodologies. These methodologies include the use of the International Geosphere-Biosphere Programme (IGBP), University of Maryland Leaf Area Index (LAI), BIOME-Biogeochemical Cycles (BGC), and Plant Functional Types (PFT). The area in square kilometers and the proportion of different land cover types were computed within each grid cell from 2000 to 2020. The land cover types of interest were urban-built areas, croplands, water bodies, dense-open forests, and grasslands.[7]

III.B.2 Remote Sensing Outcomes

We estimate the effects of the refugee camps on two primary outcomes: night light density and deforestation. To confirm the consistency of the results, we also assess the impact of refugee camps on type of land use, which includes dense-open forest, grassland (typically used for agriculture or pasture), and cropped land. Descriptive statistics for these variables are presented in Table 1. The table also illustrates the years for which each of the outcomes is available. The study employs all the years for which the outcomes were available according to the source.

Moreover, the spatial distribution of the two outcomes we study before and after the Rohingya's arrival in 2017 is illustrated in Figures 5 to 6. These maps illustrate a dramatic improvement in night light density but mixed changes in deforestation. The maps for the geographical distribution of land use by type are also illustrated in Figures 7, 8, and 9. The maps of dense-open forest show a clear reduction around camps after the Rohingya's arrival, but changes in area covered by grass and crops are less evident.

[5] In the case of missing values, they were imputed with 0. This process is reliable due to the high spatial resolution of the images, which is approximately 30.92 meters.

[6] It has a spatial resolution of 500 meters, meaning that each pixel in the dataset represents an area of 500 square meters on the Earth's surface.

[7] We conducted this process using the Google Earth Engine code editor.

III.B.3 Cox's Bazar Panel Survey

The Cox's Bazar Panel Survey (CBPS) tracks social, economic, and health outcomes among a representative cohort of the displaced Rohingya population after August 2017, alongside Bangladeshi households residing close to the refugee camps in Cox's Bazar and Bandarban. The survey covers 5,016 Bangladeshi households from six *upazilas* (subdistricts) in Cox's Bazar and one *upazila* in Bandarban that also hosts Rohingya.

The CBPS is representative of two primary demographic segments in Cox's Bazar: Rohingya living in camps (comprising newly arrived as well as previously settled individuals) and the host population, encompassing both native households (with heads born in Bangladesh) and non-natives, including Rohingya.

The survey protocol includes two main components. The first is a household interview administered to one adult member that encompasses household demographics, food security, consumption patterns, assistance utilization, asset ownership, household income, and anthropometric measurements of a randomly selected child under five. The second is an adult interview conducted with three randomly chosen adults (18 years and older) that covers topics such as labor market participation, migration history, health care utilization, experiences of crime and conflict, and overall well-being. Across both rounds of data collection (2019 and 2023), CBPS conducted household interviews with 5,020 households (constituting 25,421 individuals) and adult interviews with 9,386 adults.

In the 2023 round, the same set of adults was reinterviewed, with a response rate of 97 percent of households and 80 percent of adults, corresponding to 4,996 households and 7,486 adults. The second round retained the core components of the household questionnaire and added a credit and coping module. The adult questionnaire was modified; the sections on labor market history, migration history, and experiences of crime and conflict were omitted, and three new sections were added to assess individuals' intentions to return to Myanmar, host population cohesion with the refugees, and host population perceptions of the Rohingya.

For the purposes of this analysis, we restricted the dataset to the host population. Follow-

ing the merger of data from both waves and the exclusion of the Rohingya, the resulting dataset included 12,533 individuals in 2019 and 4,854 individuals in 2023.

Descriptive statistics for the variables employed in this study are in Table 2. The analysis suggests that the population around the refugee camps is disproportionately young (on average 26 years of age) and mostly balanced in terms of gender composition (48 percent males). Additionally, household size is on average six individuals.

III.B.4 Individual-Level Outcomes

Table 2, spanning Panels C to H, provides descriptive statistics for each of the individual-level outcomes. These outcomes are grouped in several categories including: (i) adult and household welfare, (ii) labor market dynamics, (iii) health and education outcomes, (iv) safety perceptions, and (v) hosts' attitudes toward the displaced population. A detailed definition of all the variables is included in Appendix B.

Adult and household welfare. Adult's welfare comprises measures of wealth, income, expenditures, consumption, and assistance. The impacts of camps are first assessed in a wealth index constructed as a composite measure of a household's cumulative living standards following the formula from the Demographic and Health Surveys.[8] The analysis comprehends the effects of camps on the total wealth index and on each subcomponent, including the proportion of service access, the proportion of adequate shelter materials, and the proportion of assets consumed. Second, the effects of refugee camps are assessed on total income and expenditures (including food and non-food). Third, the analysis evaluates outcomes related to food consumption, including: food consumption variety, share of self-produced, the share of food products for which aid was received, and indicator variables for bartering food. Fourth, since the Rohingya are completely dependent on humanitarian aid, the effects of camps are assessed on aid and assistance, including the following variables: receiving vouchers, food in-kind, assistance accessing services, and receiving household items. The descriptive statistics for aid-related outcomes (Panel C), underscore the vulnerability of the population near the camps, with a vast majority (at

[8]Details on the index construction can be found in the following link : https://dhsprogram.com/topics/wealth-index/Wealth-Index-Construction.cfm.

least 65 percent of respondents) receiving some form of assistance.

Labor market. The selected outcomes aim to assess how living near refugee camps affects local labor market dynamics. These outcomes encompass several variables including: labor force, the likelihood of employment, average monthly wages, typical weekly working hours, the prevalence of written employment contracts, unemployment, and the nature of the employer for salaried workers. Panel D presents descriptive statistics for these variables.[9] The data indicates that within the working-age population, 19 percent are employed, with an average working week of approximately 17.5 hours. Furthermore, there is a notable degree of informality in employment, as evidenced by the fact that only 14.2 percent of individuals possess a written contract and that the majority of provider types are self-employers (56 percent).

Health and education. Descriptive statistics for these variables are detailed in Panels E and F. Health outcomes focus on the prevalence of viral infections, types of health providers, and subjective perceptions of health-related dimensions. The prevalence of symptoms common to viral infections include the likelihood of having diarrhea, fever, and cough in the last month. Among these, diarrhea is the least reported symptom at 7.1 percent, followed by cough (22 percent) and fever (49.3 percent). The health service providers used by those living near the camps include the United Nations (UN), NGOs, private services, and religion-based health care. A significant majority, around 80 percent of individuals, opt for private health service providers. Additionally, subjective perceptions of health-related dimensions correspond to perceptions of changes post-2017. Notably, more than 60 percent of respondents generally reported improvements across all health-related dimensions, including improved overall health care, possibly due to increased humanitarian aid.

In terms of education, we analyze changes in student status and enrollment at various educational levels, detailed in Panel E. We evaluate these outcomes as an internal validity test. Since Rohingya children cannot leave the camps (and therefore cannot attend schools

[9] Labor market variables are limited to the working-age population in Bangladesh, defined as individuals between 14 and 60 years old.

outside camps), we expect negligible effects of camp proximity in these outcomes.

Safety perceptions. These outcomes focus on self-reports of experiencing or witnessing violent events, including serious injuries, combat situations, sexual abuse, and homicides. The likelihood of encountering each of these occurrences is outlined in Panel H. The data reveals that the most commonly reported incidents are experiencing a serious injury, with a prevalence of 13.3 percent, and being in a combat situation, reported by 11.5 percent of respondents. Encouragingly, the occurrence of other events such as sexual abuse and homicides is relatively rare, with each having a probability of less than 5 percent.

Hosts' attitudes toward displaced population. This study explores five specific outcome variables that reflect the host community's attitudes toward the Rohingya. These variables, described in Panel I, are presented as dichotomous, capturing whether respondents agreed or disagreed with various statements. First, only 11.7 percent of respondents reported that their families had benefited from the presence of the Rohingya. In terms of safety, a substantial 73.9 percent believed that the Rohingya presence had negatively impacted it. Regarding the living arrangements of the Rohingya, 97.3 percent said the Rohingya should reside exclusively in camps. Concerning economic comparisons, 42.7 percent of the respondents agreed that the Rohingya were poorer than the local population. Lastly, 86.8 percent felt that the needs of the Rohingya should be met by external entities.

IV IMPACTS OF REFUGEE CAMPS ON NIGHT LIGHT AND DEFORESTATION

Table 5 presents the results of the estimates of equation (1) on the two main outcomes of night light density and deforestation. The table illustrates the results of the estimates using the raw data as outcomes as well as using the inverse hyperbolic sine transformation of the variables.[10] Panel A details the main specification from equation (1), while Panel B examines the robustness of these findings by controlling for potential differential linear trends, a procedure known as the non-inferiority test (Bilinski and Hatfield 2018).[11] While Figure 10 depicts the trends in night light density near and far from the camps, indicating

[10]This transformation is commonly used on variables with numerous zeroes in their distribution and is interpreted as a logarithm transformation (Burbidge, Magee and Robb 1988 and MacKinnon and Magee 1990).

[11]The exercise accounts for the possibility that grids that were closer to and farther from the camps may have had different trends in the outcomes.

parallel trends, the corresponding figure for deforestation outcomes is less conclusive. Therefore, it is prudent to adjust for potential differential time trends in order to alleviate concerns regarding the methodology's validity.

The findings consistently show that proximity to the most populated camps after the Rohingya's arrival led to increased night light density and deforestation, though the impact is more pronounced for night light density. Specifically, column (2) in Panel A indicates that a one-unit increase in the standard deviation of SID results in a 1.7 percent increase in night light density and a marginal 0.02 percent increase in deforestation. An additional one-unit standard deviation in SID implies that the Euclidean distance between the coordinates decreases by 0.20 units (1/3.172), which is approximately equivalent to a reduction in distance of 30 km or 18.6 miles. Hence, the estimates suggest that when proximity of a grid to the refugee camps increases by 30 km (18.6 miles), night light density increases by 1.7 percent and deforestation increases by 0.02 percent. Considering that a one pp change in night light density corresponds to a 0.28 pp change in GDP (Henderson, Storeygard and Weil 2012), grid areas 30 km closer to the camps had approximately 0.5 percent higher GDP (1.7×0.28 = 0.47) than grids farther away. These results remain robust after restricting the sample to grids that are either closest to or farthest from the camps, ensuring a cleaner control group. The detailed results can be found in Table C.1.

The validity of these findings is further corroborated by Table 4, which demonstrates that closer proximity to the camps after the Rohingya's arrival corresponds to a decrease in dense-open forest and an increase in areas used for grass and crops. More precisely, Panel A shows that a one-unit increase in the standard deviation of SID leads to a 0.7 percent reduction in dense-open forest coverage, while areas for grass and crops increase by 0.7 percent and 0.4 percent, respectively. In summary, the data reveals complex effects of hosting displaced populations. The increases in night light density, however, are much greater than the increases in deforestation or the decreases in forest-covered land.

V IMPACTS OF REFUGEE CAMPS ON INDIVIDUAL-LEVEL OUTCOMES

The impacts of proximity to the refugee camps cannot be estimated using a difference-in-differences methodology since the two waves of data were collected in 2019 and 2023,

respectively, after the Rohingya arrived in the district. Consequently, the effects of proximity to the refugee camps are estimated using the following specification:

$$Y_{ijt} = \alpha_0 + \alpha_1 \text{SID Camps}_{ij} + X'_{ijt} + \alpha_3 Wave_t + \epsilon_{ijt} \tag{3}$$

where i represents the individual, j the household, and t the survey wave (2019 or 2023). In this equation all the symbols represent the same variables as described in equation (1). X'_{it} is a vector of individual characteristics including age, sex, household size, marital status, a dichotomous variable for the household head, and an indicator variable for having enough income to cover basic expenses in 2017 (measured pre-mass migration episode through a retrospective question). $Wave$ represent fixed effects for survey wave and ϵ are clustered standard errors at the *upazila* (subdistrict) level.

The coefficient of interest is α_1, which measures the change in the outcomes when the standard deviation of SID increases by 1 unit. As mentioned earlier, according to the descriptive statistics presented in Table 2 for the distance measures, a one-standard-deviation increase in SID equals a reduction in distance to the camps of 0.2 units (1/5.04) or approximately 30 km.

V.A Adult and Household Welfare

The findings related to adult and household welfare outcomes are detailed in Table 5. Panel A presents estimates for the outcomes related to wealth, Panel B the outcomes related to income and expenditures, Panel C the outcomes related to food consumption, and Panel D the outcomes related to assistance. The analysis suggests that camps have no statistically significant effects on outcomes related to wealth, income, and expenditures. However, the estimates in Panel C suggest that when SID increases by one standard deviation—that is, the distance between individuals and the camps drops by 30 km—food variety consumption increases by one pp, the likelihood of receiving humanitarian food aid increases by 8.3 pp, and the likelihood of receiving gift or barter food increases by 0.05 pp. The results align with the estimates in Panel D regarding the effects of camps on the likelihood of receiving assistance. Particularly, the estimates suggest that individuals

located 30 km closer to a camp are more likely to receive food in-kind (5.5 pp) and receive assistance in the form of household items (10.6 pp). All in all, the results suggest that the welfare effects of camps on nearby adults and households are limited and mostly relate to a higher probability of receiving food in-kind from humanitarian organizations.

V.B Labor Market

The findings related to labor market outcomes are in Table 6. Specifically, Panel A presents the results of equation (3) regarding various aspects: the likelihood of employment, monthly wages, weekly hours worked, and the chance of having a written contract. Coefficients across these parameters indicate generally positive effects associated with closer proximity to the camps. However, statistical significance occurs only in the likelihood of having a written contract. In particular, a reduction in the weighted distance to the camps by approximately 30 km (or an increment of one standard deviation of SID) is reflected in a 4.6 pp rise in the probability of having a written contract. Considering the baseline figures presented in Table 1, these effects are substantial and represent deviations from the mean of 32 percent (4.6 divided by 14.2).

Additionally, Panel B presents estimates that describe the type of job provider for employed individuals. Unsurprisingly, they suggest that for employed individuals living closer to the camps, the likelihood of working for NGOs (probably represented by humanitarian organizations) is much larger than for people residing farther away. Moreover, the likelihood of being employed by any other provider is lower, suggesting a shift in employment patterns with a notable preference or availability of jobs in the NGO sector for those living near the camps.

V.C Health and Education

Estimates of the impacts of proximity to the refugee camps on health and education outcomes are in Tables 7 and A.3.

Table 7 presents estimates for the effect of the Rohingya's presence on health outcomes of host communities. Panel A focuses on the likelihood of exhibiting symptoms of viral diseases like diarrhea, fever, and cough. The findings reveal that an increase in proximity

to the camps by 30 km corresponds to a 2.1 pp increase in the likelihood of diarrhea, which represents a significant 30 percent deviation from the average outcome (0.071), as reported in Table 2. Additionally, there is a 3.7 pp increase in the likelihood of fever, representing a significant 7.7 percent deviation from the average outcome (0.49), and a 2.7 pp increase in the likelihood of cough, representing a 12 percent deviation from the average outcome (0.22). These results align with the findings of Dagnelie, Mayda and Maystadt (2023), who explore the effects of refugee camps on children's health outcomes in Africa. They document widespread prevalence of diarrhea and fever in refugee camps due to the high incidence of malaria there. As previously noted, this might be relevant here as Zhao et al. (2023) reports that Myanmar bore the heaviest malaria burden in the Greater Mekong Subregion between 2011 and 2017.

Panel B examines the types of health providers visited by individuals seeking care. The data indicates that those living closer to refugee camps more frequently utilize health services from the United Nations and NGOs, while the use of private providers decreases.

Panel C addresses individuals' subjective perceptions regarding changes in overall health care, including treatments, safety, and accessibility for those living closer to the camps. The results indicate no discernible or statistically significant impacts of proximity to refugee camps on any of the studied outcomes.

Table A.3 presents results for the six outcomes related to education access and quality. The results indicate no discernible or statistically significant impacts of proximity to refugee camps on any of the studied education outcomes. This lack of significant findings is likely due to the fact that the Rohingya cannot attend school outside the camps.

V.D Safety Perceptions

The analysis of the impact of camp proximity on safety-related outcomes is in Table 9. The estimates indicate that a gain of one standard deviation in SID, which stands for an increase of 30 km in proximity to the refugee camps, reverberates in heightened safety concerns. Specifically, there is a higher likelihood of experiencing serious injuries by 2.6 pp, encountering combat situations by 2.1 pp, facing near-death experiences by 1.1 pp,

and witnessing homicides of strangers (1.1 pp).

When considering the mean values for these outcomes, highlighted in Panel G of Table 2, this corresponds to meaningful increments of 20.3 percent in the likelihood of experiencing a serious injury, 18.2 percent in the likelihood of experiencing or witnessing a combat situation, and 25 percent in witnessing the homicide of a stranger. These findings reflect the worrisome consequences of proximity to the camps for the safety and security of individuals in the surrounding areas.

V.E Hosts' Attitudes toward the Displaced Rohingya Population

Table 10 presents the estimates of equation (3) concerning hosts' attitudes towards the Rohingya. Three statistically significant effects emerge from the results. First, a decrease in distance to the camps is associated with more positive perceptions among hosts regarding the benefits their families receive from the presence of the Rohingya (shown in Column (1)), with an increase of 5.8 pp. Additionally, those living closer to the camps are less likely to believe that support for the Rohingya should exclusively come from external sources, with a decrease of 2.9 pp in this view. However, respondents nearer to the camps also have heightened perceptions of negative safety impacts due to the Rohingya presence, aligning with the findings from Table 9.

V.E.1 Heterogeneous Effects

Appendix A examines the heterogeneous effects of camp exposure by age, gender, and wealth on outcomes related to safety perceptions, prevalence of viral diseases, and host attitudes. These outcomes were the ones with statistically significant results. We conduct this analysis using equation (3) and incorporate interactions of SID Camps with dichotomous variables for gender (male=1), wealth (high wealth=1 for values higher than the mean), and age (young=1 for values lower than the mean). The results suggest that individuals with high wealth have fewer safety concerns, while males and younger individuals have greater safety concerns. However, the analysis of the prevalence of viral diseases does not show any significant results. Finally, regarding host attitudes toward the Rohingya, the estimates indicate that wealthy, male, and young individuals exhibit more prosocial attitudes toward the refugees.

VI CONCLUDING REMARKS

This study investigates the impact of hosting the displaced Rohingya population on the local communities and areas surrounding the refugee camps in Cox's Bazar, Bangladesh. It utilizes a difference-in-differences approach, contrasting regions and individuals closer to and farther from the most populous camps, both before and after the Rohingya arrived. The research incorporates remote sensing data to analyze night light density, deforestation, and land use patterns, alongside longitudinal data representative of the local communities near the camps.

The findings indicate that hosting the Rohingya produces complex effects. Analysis using remote sensing data reveals that regions near the most populated camps experienced an increase in night light density and greater deforestation following the arrival of the Rohingya in 2017. These effects align with the results from land use data, which shows a decrease in dense-open forests and an increase in areas used for crops and grass. However, the magnitude of these effects varies significantly; the change in night light density is larger, while the impact on deforestation is smaller.

The individual-level data in this study presents a consistent narrative: namely, that the Rohingya presence has influenced local dynamics in Cox's Bazar. Key findings include higher formal employment, enhanced service provision (particularly in aid), more food, and a greater variety of food. This positive shift is largely due to the presence and efforts of humanitarian organizations in the area.

Nevertheless, the data also indicates some adverse effects associated with the Rohingya presence. Notably, safety concerns are higher within the host communities, as is the prevalence of viral diseases such as diarrhea, fever, and cough. Taken together, our findings underscore the multifaceted effects of refugee camps on host communities, highlighting both the beneficial and challenging aspects of hosting large displaced populations.

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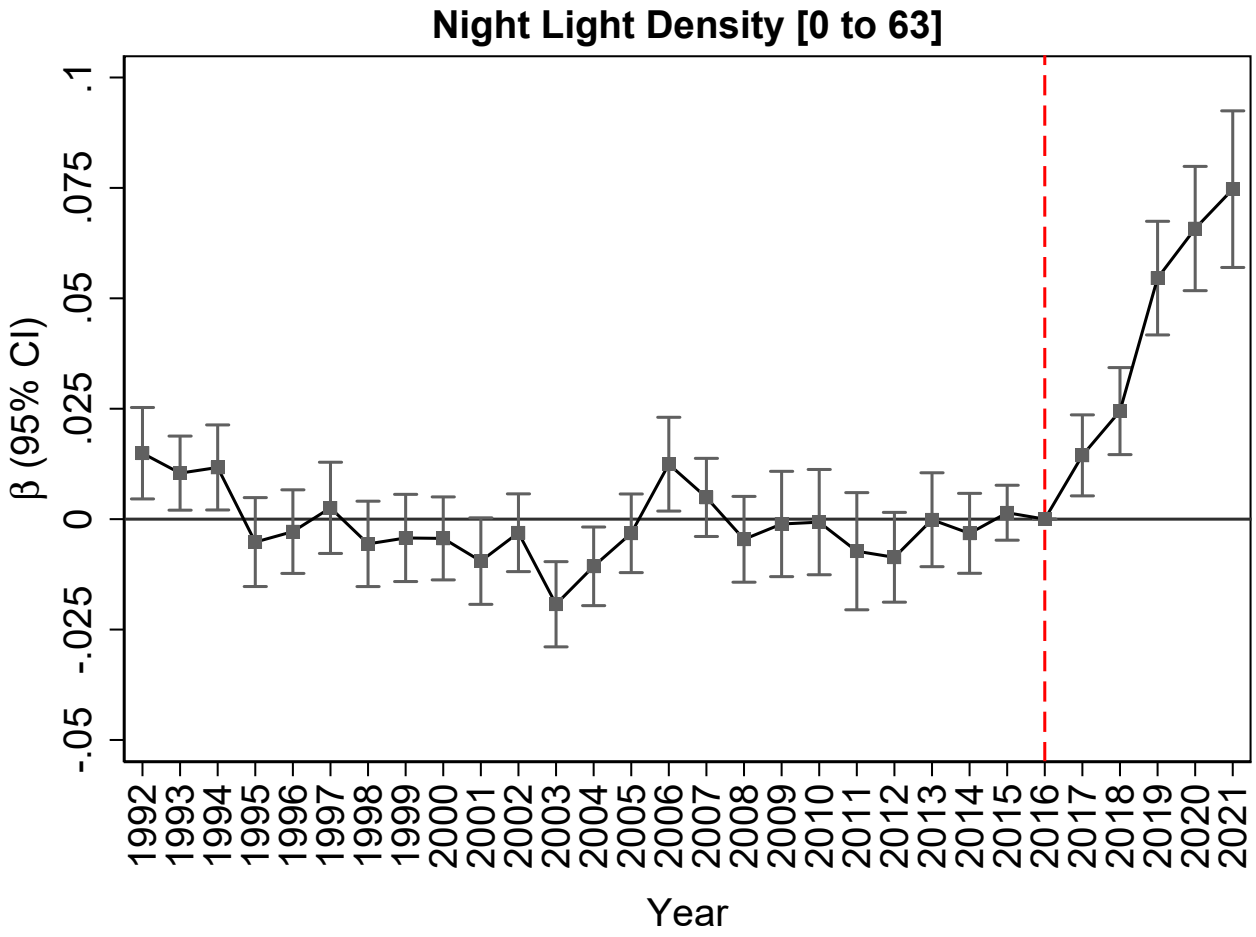
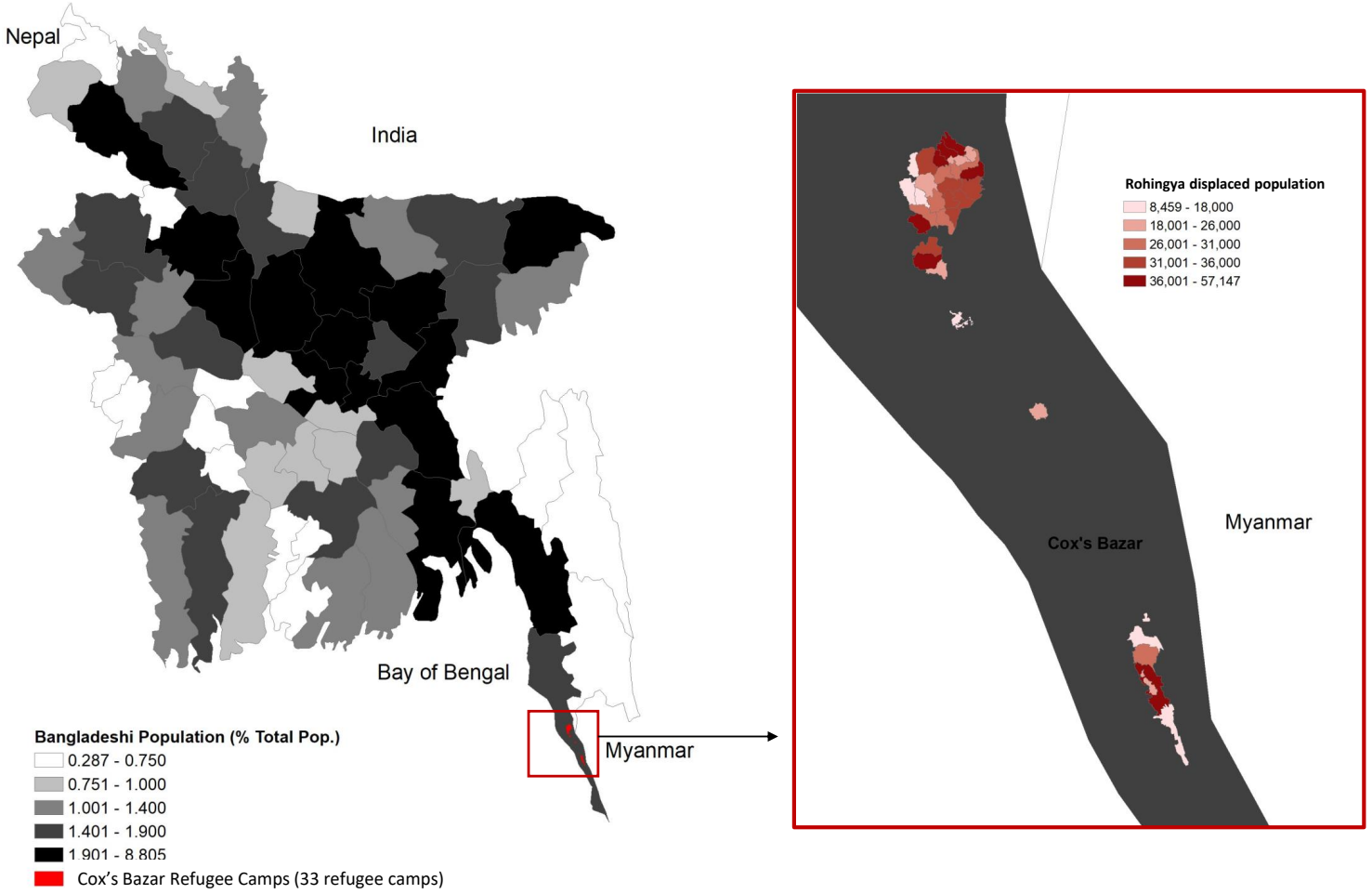
VII FIGURES

Figure 1. Event Study – Night Light Density



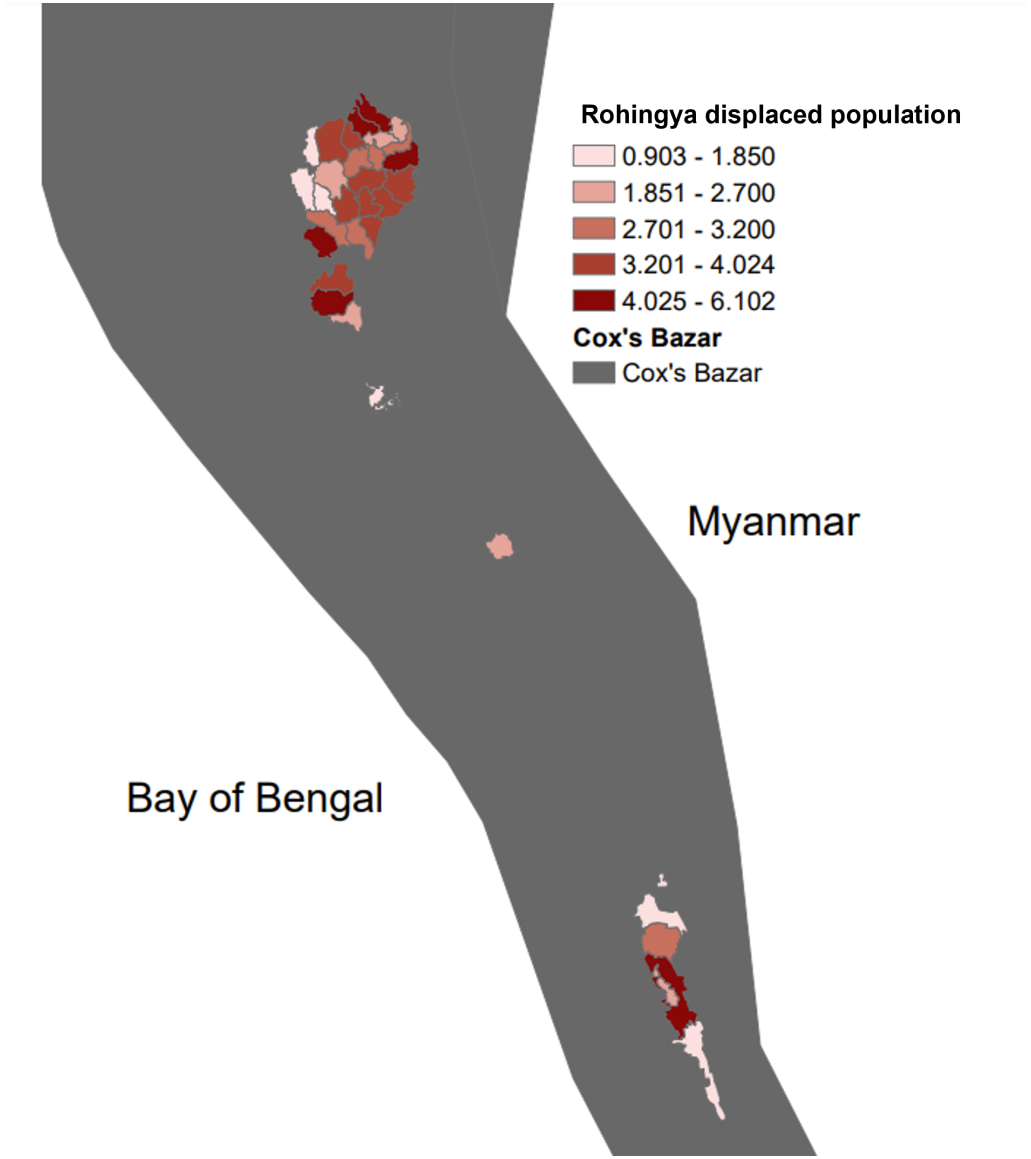
Notes: The figure shows the results of an event study estimation for night light density, using data from grids near the refugee camps. The instrument, $SIDCamps_ij$, is interacted with years from 1992 to 2021, excluding 2016, the year before the large influx of Rohingya refugees in 2017. The estimates include grid and year fixed effects, with standard errors clustered at the grid level. Bars represent 95% confidence intervals.

Figure 2. Geographic Distribution of Bangladeshi Population and Rohingya Refugees in Bangladesh



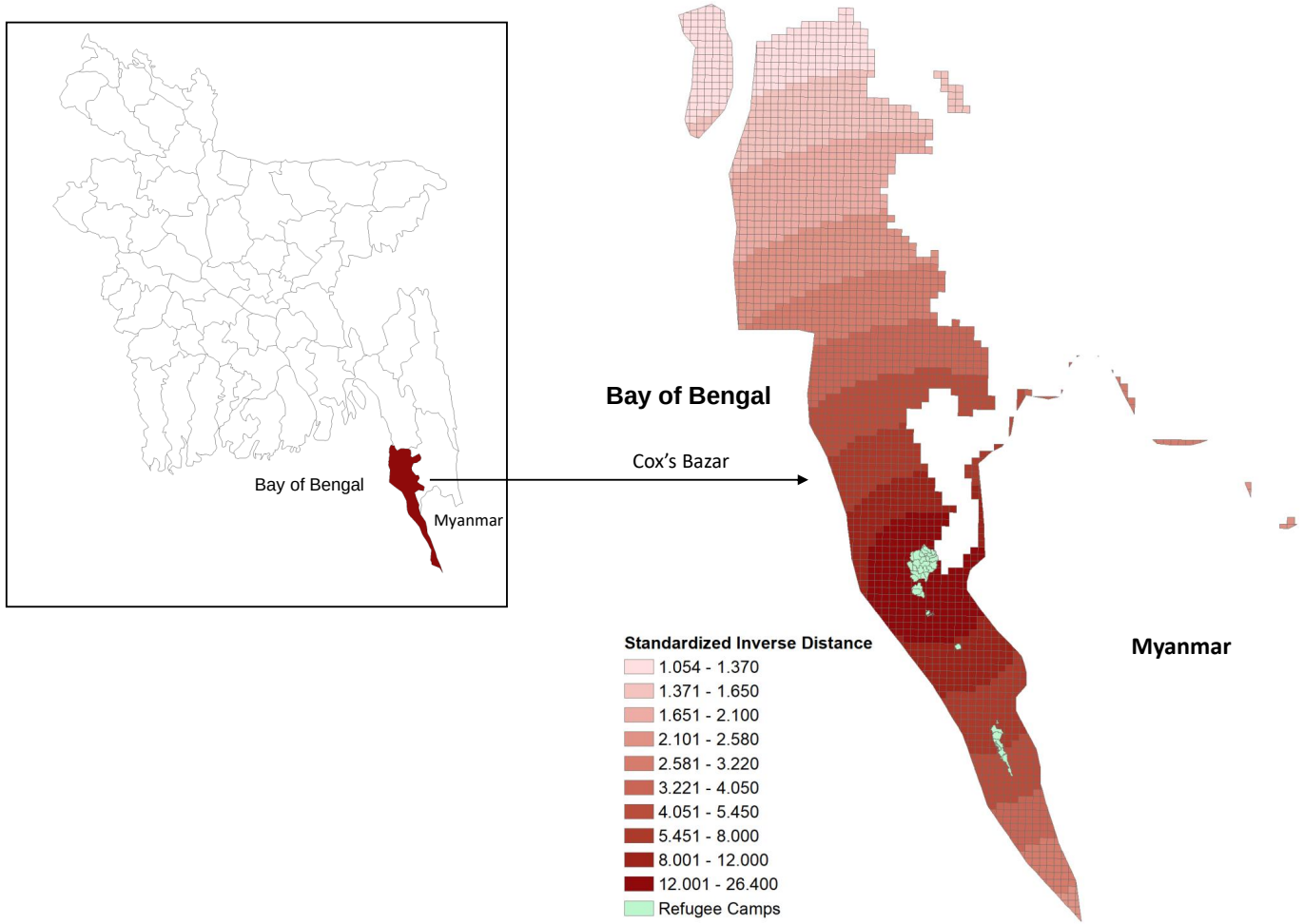
Notes: The left panel of the figure depicts the distribution of the Bangladeshi population in 2023. The right panel illustrates the number of forcibly displaced Rohingya individuals per refugee camp in the Cox's Bazar district as reported by UNHCR. Cox's Bazar has 33 refugee camps.

Figure 3. Geographic Distribution of the 33 Refugee Camps in Cox's Bazar



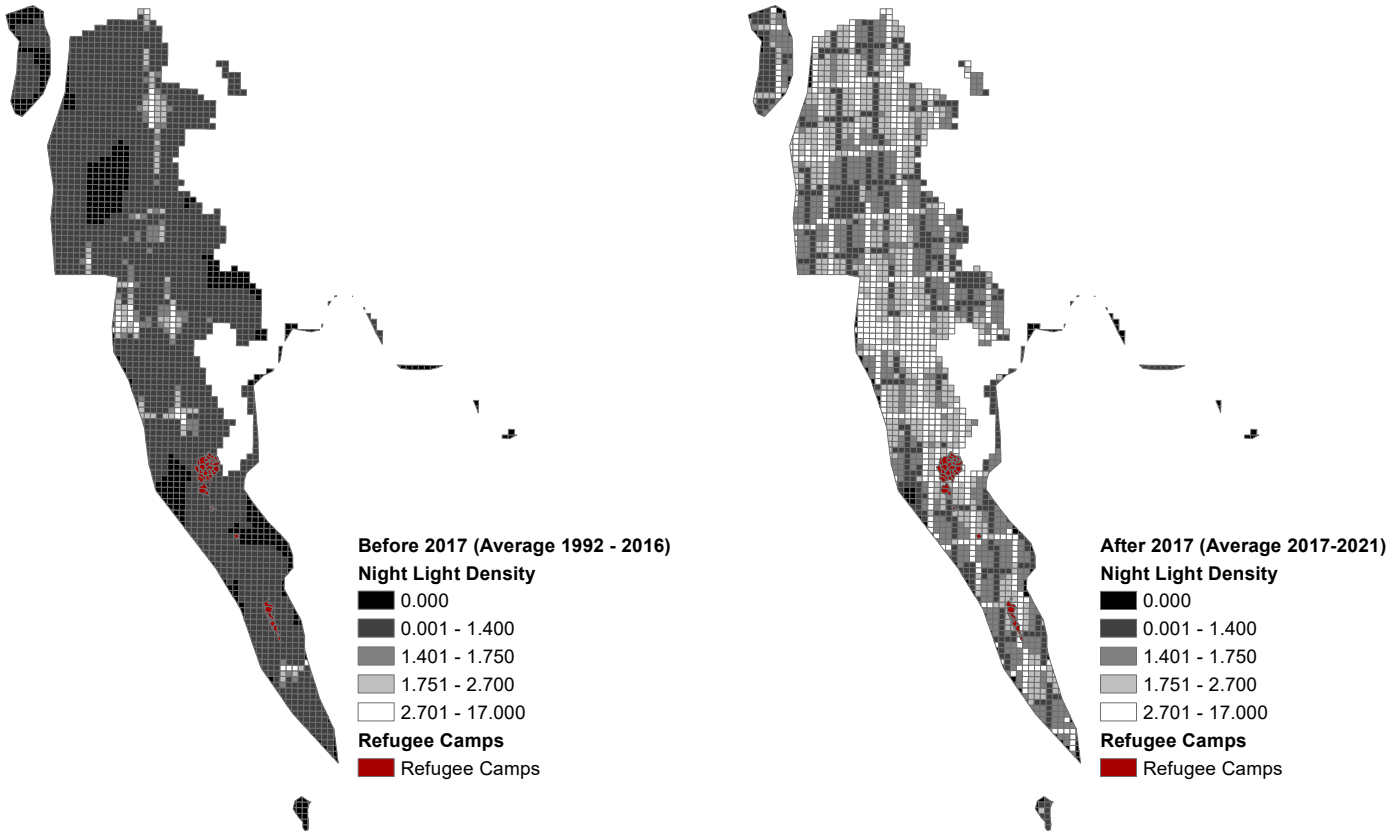
Notes: The map depicts the location of the 33 refugee camps in Cox's Bazar and the respective distribution of the Rohingya in each camp out of the total 936,482 individuals residing in Cox's Bazar. *Source:* Bangladesh Operational Data Portal, UNHCR.

Figure 4. Geographic Distribution of Standardized Weighted Inverse Distance



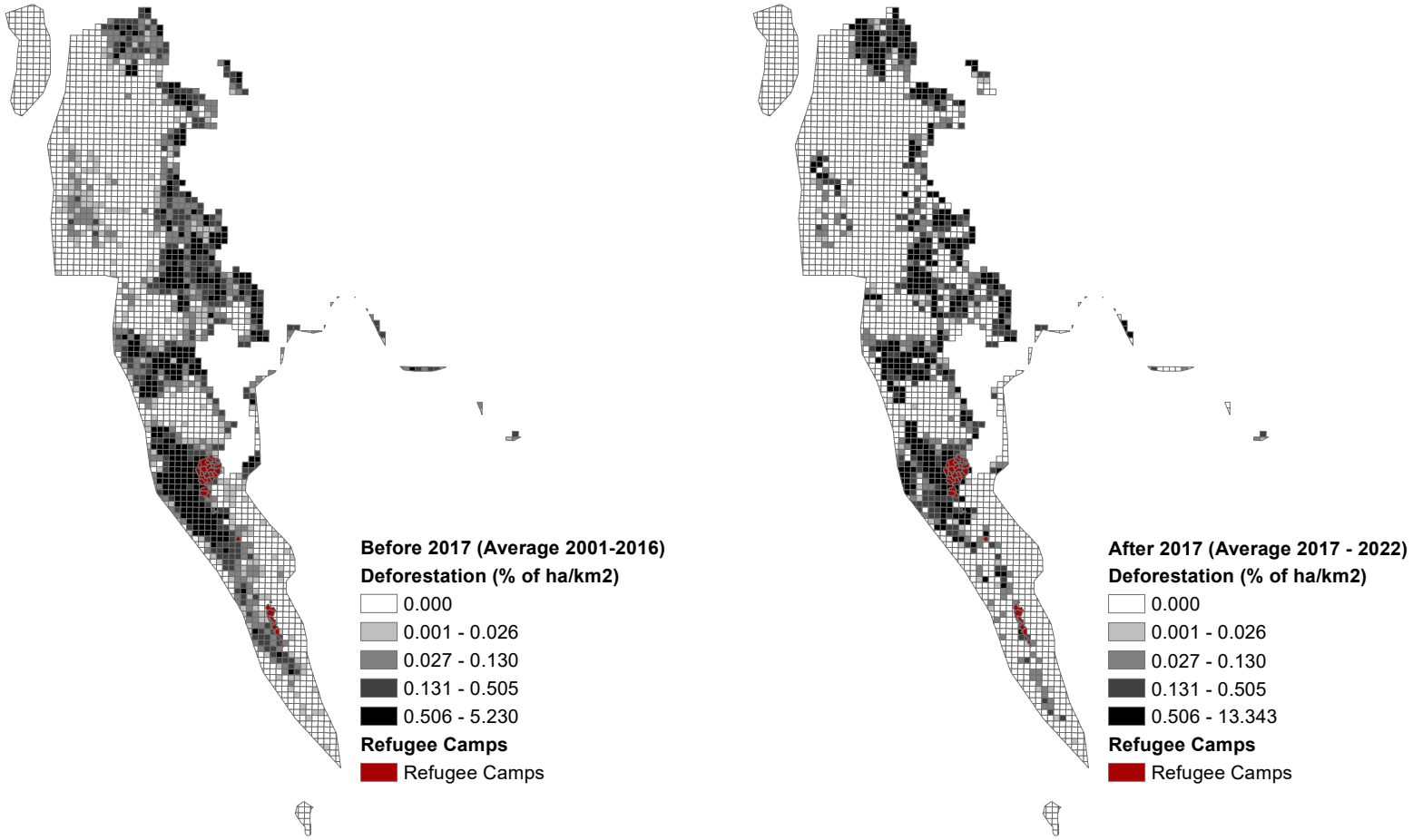
Notes: The left panel illustrates the geographic location of Cox's Bazar district in Bangladesh. The right panel displays, in 10 shaded categories, the standardized weighted inverse distance corresponding to the measure SID camps as described in equation 2 for 2,392 grid cells surrounding the 33 refugee camps and composing the Cox's Bazar district. The camps are highlighted in green.

Figure 5. Geographical Distribution – Night Light Density
Before and After the Rohingya Influx



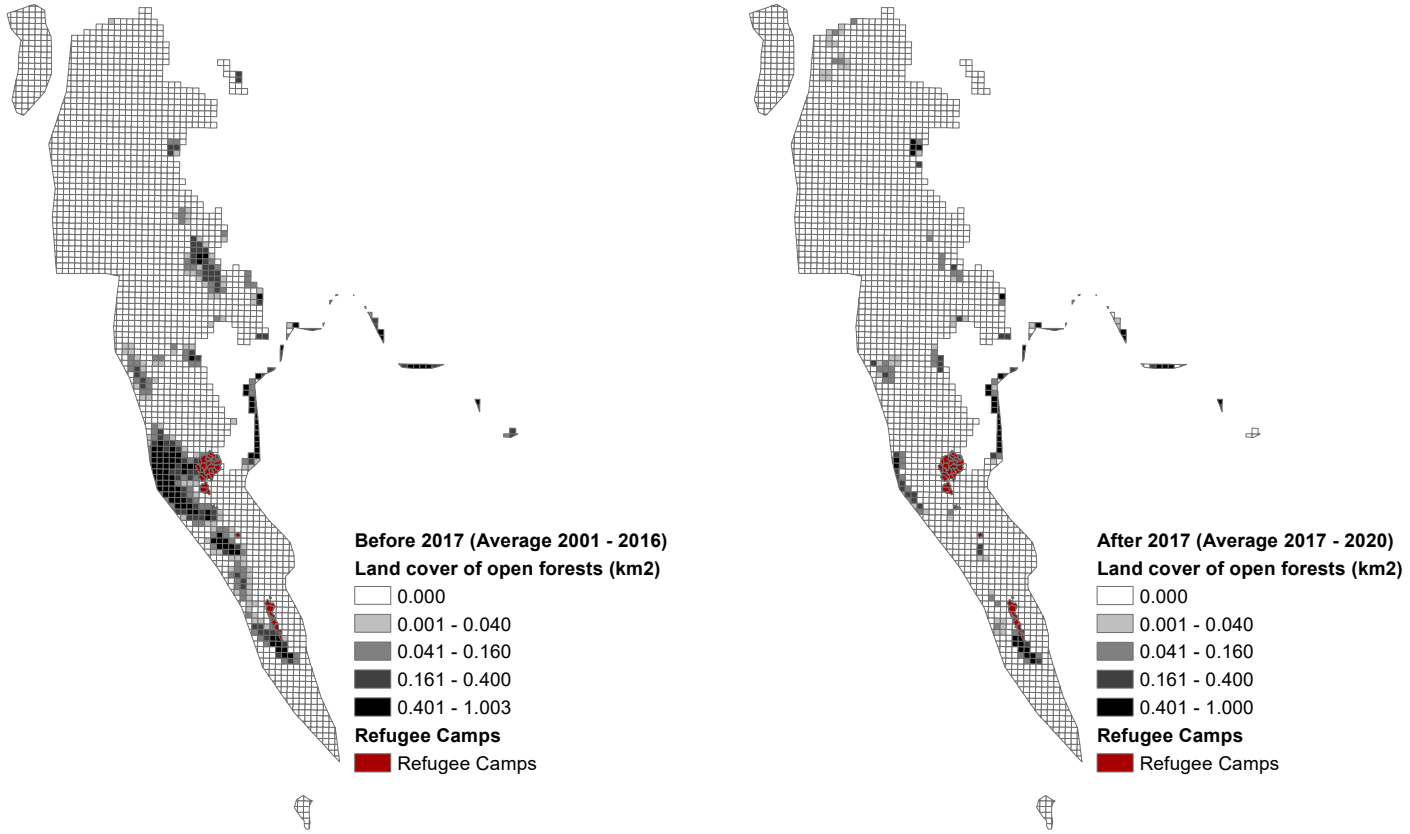
Notes: The maps illustrate the Cox's Bazar district in Bangladesh segmented into one-square-kilometer grids. The Cox's Bazar area has 2,392 grid cells. The left panel displays the distribution of night light density between 1992 and 2016, prior to the influx of Rohingya individuals into Bangladesh. The right panel portrays the distribution of night light density between 2017 and 2021, following the start of the Rohingya influx. The maps were generated using the harmonized night light data series spanning from 1992 to 2021, as developed by Li et al. (2020).

Figure 6. Geographical Distribution – Deforestation
Before and After the Rohingya Influx



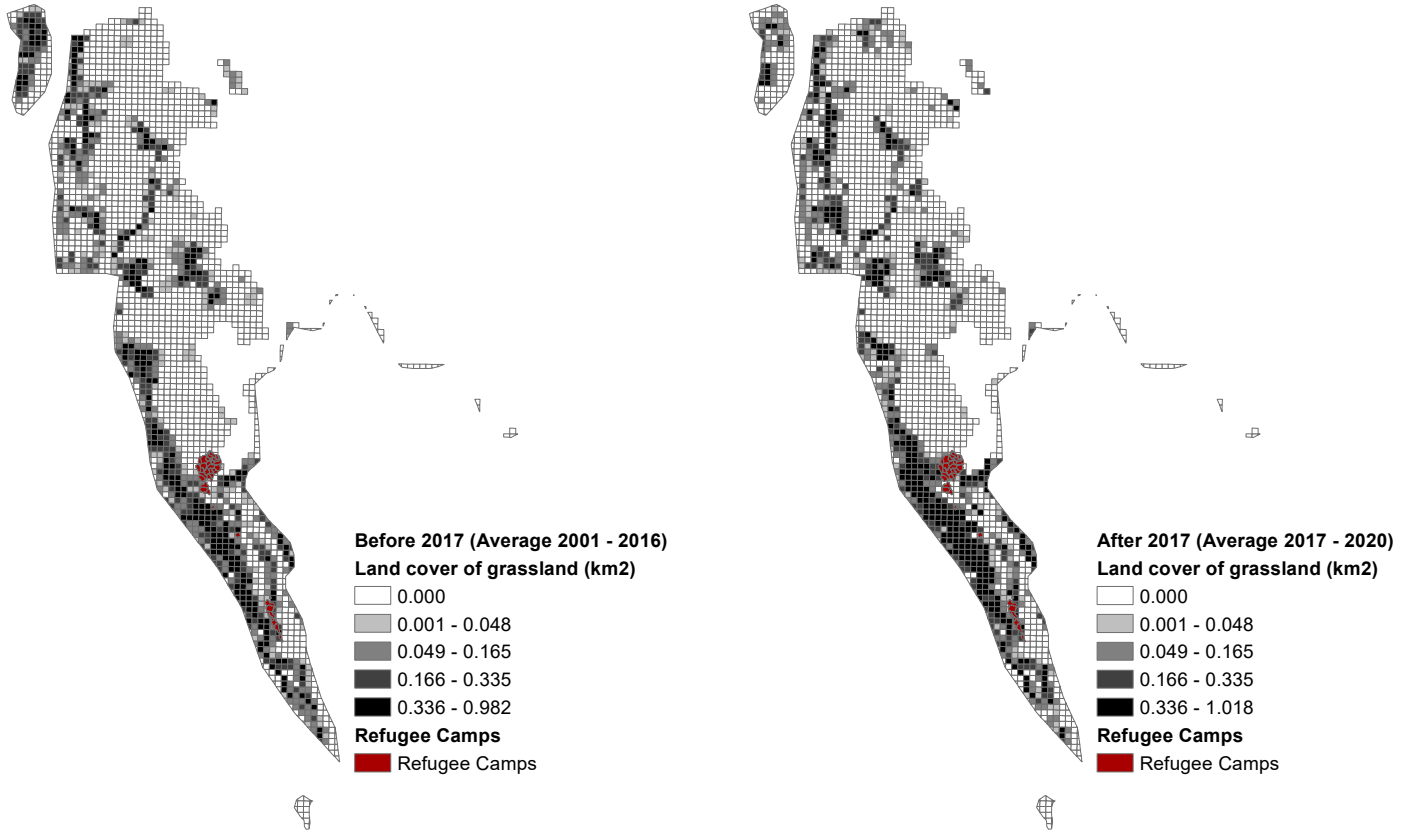
Notes: The maps illustrate the Cox's Bazar district in Bangladesh segmented into one-square-kilometer grids. The Cox's Bazar area has 2,392 grid cells. The left panel displays the distribution of forest loss between 2001 and 2016, prior to the influx of Rohingya into Bangladesh. The right panel portrays the distribution of forest loss between 2017 and 2022, following the start of the Rohingya influx.

Figure 7. Geographical Distribution – Land Covered by Dense-Open Forests
Before and After the Rohingya Influx



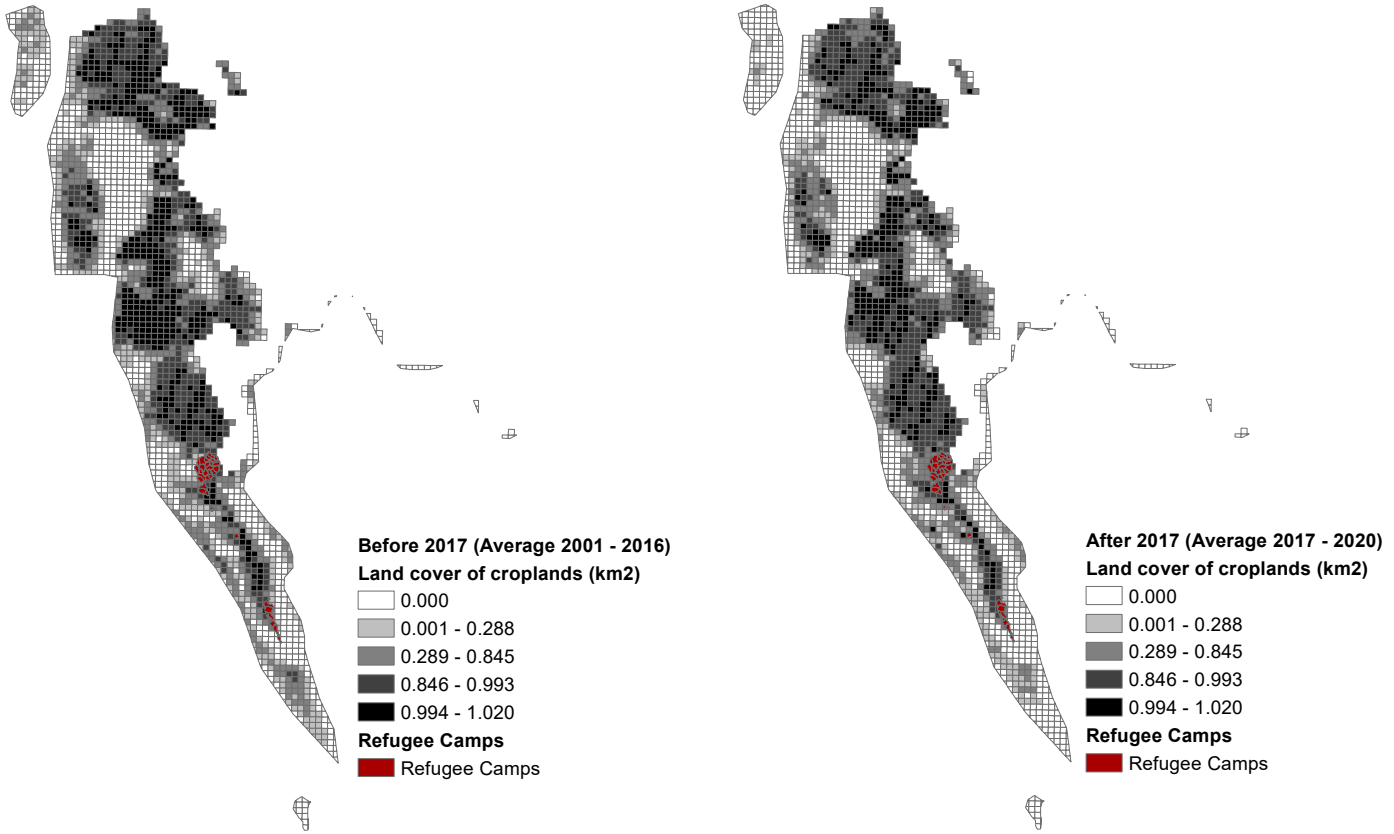
Notes: The maps illustrate the Cox's Bazar district in Bangladesh segmented into one-square-kilometer grids. The Cox's Bazar area has 2,392 grid cells. The left panel displays the distribution of the land covered by dense-open forests between 2001 and 2016, prior to the influx of Rohingya individuals into Bangladesh. The right panel portrays the distribution of the land covered by dense-open forests between 2017 and 2020, following the start of the Rohingya influx.

Figure 8. Geographical Distribution – Land Covered by Grass
Before and After the Rohingya Influx



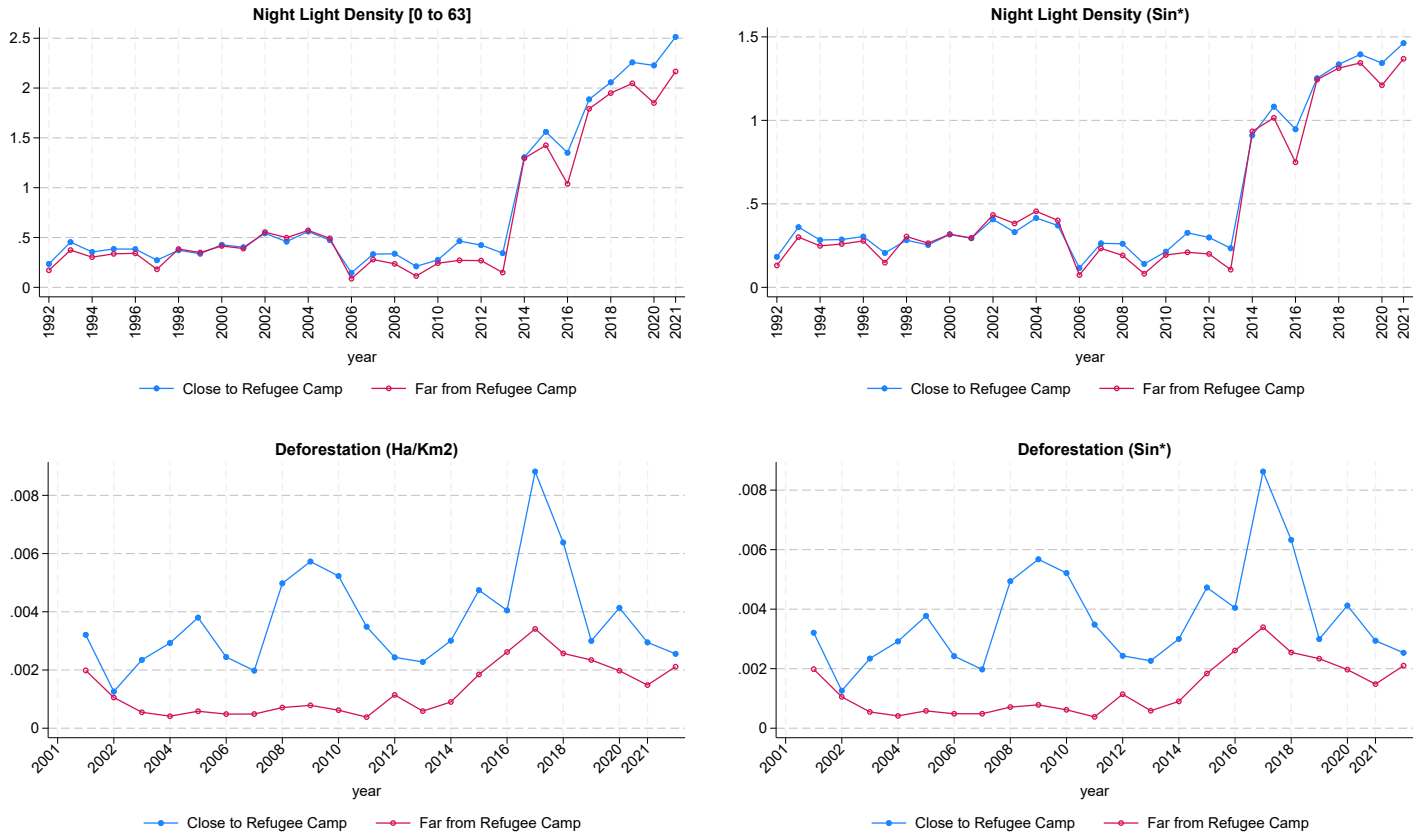
Notes: The maps illustrate the Cox's Bazar district in Bangladesh segmented into one-square-kilometer grids. The Cox's Bazar area has 2,392 grid cells. The left map displays the distribution of land covered by grassland between 2001 and 2016, prior to the mass inflow of Rohingya individuals into Bangladesh. The right map portrays the distribution of land covered by grassland between 2017 and 2020, following the start of the Rohingya influx.

Figure 9. Geographical Distribution – Land Covered by Crops
Before and After the Rohingya Influx



Notes: The maps illustrate the Cox's Bazar district in Bangladesh segmented into one-square-kilometer grids. The Cox's Bazar area has 2,392 grid cells. The left panel displays the distribution of the land covered by croplands between 2001 and 2016, prior to the mass inflow of Rohingya into Bangladesh. The right panel portrays the distribution of land covered by croplands between 2017 and 2020, following the start of the Rohingya influx.

Figure 10. Evolution of Outcomes by Distance to the Refugee Camps – Economic Outcomes



Notes: The figure illustrates the annual changes in night light density and deforestation outcomes, categorized into two groups: grids near and far from the refugee camps.

VIII TABLES

Table 1. Descriptive Statistics – Remote Sensing Data

	Average	Std. Deviation	Observations	Years Available
Night Light Density [0 to 63]	0.732	1.159	71,760	1992-2021
Deforestation (Ha/Km2)	0.003	0.017	52,624	2001-2022
Land cover of dense-open forests (Km2)	0.035	0.153	47,840	2001-2020
Land cover of grassland (Km2)	0.089	0.193	47,840	2001-2022
Land cover of croplands (Km2)	0.460	0.441	47,840	2001-2024

Notes: The table reports the descriptive statistics of the outcomes for which we examine the impacts of the Cox's Bazar refugee camps. Variables definition: (i) Night light density [0 to 63]: This variable represents the average light density at the grid level, obtained by averaging across pixels at the desired level of aggregation. Values range from 0 (no light) to 63 (maximum light density). (ii) Deforestation Ha/Km^2: This variable corresponds to landsat images from the Hansen Global Forest Change, focusing on identifying forest loss defined as the transformation of forested areas into non-forested ones due to stand-replacement disturbances. The measure is expressed in hectares per square kilometer. (iii) Dense-open forests refer to areas with dense canopy cover (¿40% tree cover), characterized by high values of vegetation indices such as the Normalized Difference Vegetation Index (NDVI) or Enhanced Vegetation Index (EVI), indicating vigorous and dense vegetation. (iv) Grassland refers to vegetated areas dominated by grasses, herbs, and other non-woody vegetation, typically with sparse to moderate tree cover or no trees present. (v) Croplands refer to areas of land specifically designated or utilized for agricultural cultivation, including the cultivation of crops such as grains, vegetables, fruits, and other agricultural products.

Table 2. Descriptive Statistics – Cox's Bazar Panel Survey

	Average	Std. Deviation	Observations
A. Measures of the Distance from an Individual's Location to the 33 Refugee Camps			
Weighted distance to refugee camps	0.325	0.205	17,407
Inverse of weighted distance to refugee camps	5.042	3.874	17,407
B. Control Variables			
Age	26.217	18.154	17,032
Male [=1]	0.486	0.500	17,030
Household Head [=1]	0.235	0.424	17,037
Married [=1]	0.588	0.492	13,760
Household size	5.861	2.336	17,407
Enough household income in 2017 [=1, measured pre-influx]	0.479	0.500	17,350
C. Adult and Household Welfare			
Wealth Index	-0.006	2.135	12,334
Proportion of service access - subcomponent	0.679	0.329	17,282
Proportion of adequate shelter materials - subcomponent	0.652	0.256	17,282
Proportion of total assets - subcomponent	0.306	0.149	17,282
Household income (Takas)	19,357	36,964	12,553
Household expenditures (Takas)	6,178	5,850	12,553
Non-food household expenditures (Takas)	1,830	2,190	12,553
Food household expenditures (Takas)	4,349	4,800	12,553
Food Variety Consumption (Share of Products)	0.414	0.128	12,553
Self-Produced Food (Share of products)	0.770	0.421	12,553
Humanitarian Food Aid (Share of Products)	0.091	0.287	12,553
Gift or Barter Food (Share of Products)	0.207	0.181	12,553
Received vouchers, cash, in-kind assistance [Yes=1]	0.427	0.495	1,322
Received food in-kind [Yes=1]	0.649	0.477	4,020
Assistance for basic services [Yes=1]	0.656	0.475	7,546
Assistance for household items [Yes=1]	0.150	0.357	4,117
D. Labor Market Outcomes			
Labor force	0.138	0.345	11,037
Employed [Yes=1]	0.195	0.397	6,953
Monthly wage (Takas)	1,088	8,403	8,735
Weekly hours worked	17.523	24.736	8,703
Written contract [Yes=1]	0.142	0.349	1,633
Work for a government organization [Yes=1]	0.075	0.263	1,938
Work for a private company [Yes=1]	0.072	0.258	1,938
Work for an NGO [Yes=1]	0.105	0.306	1,938
Work for a household [Yes=1]	0.096	0.295	1,938
Work self-employed [Yes=1]	0.564	0.496	1,938
Work for a mill [Yes=1]	0.064	0.245	1,938

Notes: The table presents descriptive statistics for the sample of hosts living around the refugee camps in Cox's Bazar. Detailed variable definitions can be found in Appendix B.

Table 2 (Cont'd). Descriptive Statistics – Cox's Bazar Panel Survey

	Average	Std. Deviation	Observations
E. Health-related Outcomes			
Suffered from diarrhea last month [Yes=1]	0.071	0.257	1,842
Suffered from fever last month [Yes=1]	0.493	0.500	3,374
Suffered from cough last month [Yes=1]	0.224	0.417	2,206
Health provider: UN	0.006	0.076	7,173
Health provider: NGO	0.017	0.130	7,173
Health provider: Privately run	0.788	0.409	7,173
Health provider: Religious group	0.005	0.071	7,173
After 2017: Improved overall health care [Yes=1]	0.784	0.411	4,344
After 2017: Improved treatment in health care [Yes=1]	0.683	0.465	2,954
After 2017: Improved health care safety [Yes=1]	0.608	0.488	2,388
After 2017: Improved health care accessibility [Yes=1]	0.698	0.459	3,102
F. Education-related Outcomes			
Student [=1]	0.577	0.494	7,950
Primary Education [=1]	0.768	0.422	1,749
Junior Secondary Education [=1]	0.292	0.455	1,156
Secondary Education [=1]	0.196	0.397	725
Higher Secondary Education [=1]	0.037	0.188	765
Post-graduate Education [=1]	0.037	0.189	2,679
G. Safety-related Outcomes: Did you experience or witness...			
Serious injury [Yes=1]	0.133	0.339	17,407
Combat situation [Yes=1]	0.115	0.319	17,407
Rape or sexual abuse [Yes=1]	0.019	0.137	17,407
Being close to death [Yes=1]	0.066	0.249	17,407
Witnessed murder of family or friend [Yes=1]	0.021	0.143	17,407
Witnessed murder of stranger or strangers [Yes=1]	0.040	0.197	17,407
H. Host's Attitudes Toward Rohingya Displaced Population			
My family benefited from Rohingya presence	0.117	0.322	3,595
Rohingya presence negatively impacts neighborhood safety	0.739	0.439	4,031
Rohingya should live exclusively in camps	0.973	0.163	4,031
Rohingya families are poorer than local vulnerable families	0.427	0.495	4,031
Rohingya basic needs should just be covered by external entities	0.868	0.339	4,031

Notes: The table presents descriptive statistics for the sample of hosts living around the refugee camps in Cox's Bazar. Detailed variable definitions can be found in Appendix B.

Table 3. Impacts of Refugee Camps on Local Economic Development

	Night Light Density		Deforestation	
	[0 to 63]	Sin*	Ha/Km^2	Sin*
	(1)	(2)	(3)	(4)
A. Main Specification				
SID × I(Post 2017)	0.034***	0.017***	0.0002**	0.0002**
	(0.006)	(0.002)	(0.0001)	(0.0001)
FDR q-values	[0.001]	[0.001]	[0.032]	[0.032]
R-squared	0.686	0.741	0.126	0.127
Observations	71,760	71,760	52,624	52,624
B. Controlling for differential linear pre-trends				
SID × I(Post 2017)	0.039***	0.026***	0.0004***	0.0004***
	(0.008)	(0.003)	(0.0002)	(0.0002)
FDR q-values	[0.001]	[0.001]	[0.009]	[0.009]
R-squared	0.686	0.741	0.126	0.128
Observations	71,760	71,760	52,624	52,624
Mean Dep. Variable	0.732	0.509	0.003	0.003
Controls (All Panels)				
Grid FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Notes: Panel A presents the results of the main specification outlined in equation 1. Panel B shows the results for the non-inferiority test proposed by Bilinski and Hatfield 2018. These results detail the main specification while controlling for an indicator variable representing differential linear pre-trends between the treatment and control groups. SID represents standardized values of the inverse distance from each grid to the refugee camps, and $\mathrm{I(Post2017)}$ is an indicator variable with a value of 1 post-2017, marking the onset of substantial Rohingya inflows to Bangladesh. Dependent variables include: (i) Night light density [0 to 63]: This variable represents the average light density at the grid level, obtained by averaging across pixels at the desired level of aggregation. Values range from 0 (no light) to 63 (maximum light density). (ii) Night light density Sin*: This variable is the inverse hyperbolic sine transformation of the original night light density variable, interpretable as a logarithm transformation. (iii) Deforestation Ha/Km^2: This variable corresponds to landsat images from the Hansen Global Forest Change, focusing on identifying forest loss defined as the transformation of forested areas into non-forested ones due to stand-replacement disturbances. The measure is expressed in hectares per square kilometer. (iv) Deforestation (Sin*): This variable represents the inverse hyperbolic sine transformation of the original deforestation variable, also interpretable as a logarithm transformation. The estimates account for grid and year fixed effects, with clustered standard errors reported at the grid level in parentheses. False Discovery Rate (FDR) q-values are reported in brackets. Significance levels are denoted as follows: *** significant at the 1%, ** significant at the 5%, * significant at the 10%.

Table 4. Impacts of Refugee Camps on Land Use Outcomes

	Land Cover					
	Dense-Open Forests		Grassland		Croplands	
	Km	Sin*	Km	Sin*	Km	Sin*
	(1)	(2)	(3)	(4)	(5)	(6)
A. Main Specification						
SID × I(Post 2017)	-0.008***	-0.007***	0.008***	0.007***	0.005***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
FDR q-values	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
R-squared	0.650	0.657	0.724	0.732	0.960	0.959
Observations	47,840	47,840	47,840	47,840	47,840	47,840
B. Controlling for differential linear pre-trends						
SID × I(Post 2017)	-0.008***	-0.007***	0.010***	0.009***	0.006***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
FDR q-values	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
R-squared	0.650	0.657	0.725	0.732	0.960	0.959
Observations	47,840	47,840	47,840	47,840	47,840	47,840
Mean Dep. Variable	0.035	0.033	0.089	0.085	0.460	0.414
Controls (All Panels)						
Grid FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Panel A presents the results of our main specification, as outlined in equation 1. Panel B shows the results for the non-inferiority test proposed by Bilinski and Hatfield 2018. It shows the results of the main specification in equation, controlling for an indicator variable of differential linear pre-trends between the treatment and control groups. SID denotes standardized values of the inverse distance from each grid to the refugee camps, and $\mathrm{I(Post2017)}$ is an indicator variable with a value of 1 post-2017, marking the onset of the substantial Rohingya inflows to Bangladesh. Dependent variables are constructed using the MODIS Land Cover Type dataset, which captures Earth's land surface imagery every 1 to 2 days, providing measurements of area in square km by land use type. (i) Dense-open forests refer to areas with dense canopy cover (¿40% tree cover), characterized by high values of vegetation indices such as the Normalized Difference Vegetation Index (NDVI) or Enhanced Vegetation Index (EVI), indicating vigorous and dense vegetation. (ii) Grassland refers to vegetated areas dominated by grasses, herbs, and other non-woody vegetation, typically with sparse to moderate tree cover or no trees present. (iii) Croplands refer to areas of land specifically designated or utilized for agricultural cultivation, including the cultivation of crops such as grains, vegetables, fruits, and other agricultural products. (Sin*) represents the inverse hyperbolic sine transformation, interpretable as a logarithm transformation. The estimates account for grid and year fixed effects, with clustered standard errors reported at the grid level in parentheses. False Discovery Rate (FDR) q-values are reported in brackets. Significance levels are denoted as follows: *** significant at the 1%, ** significant at the 5%, * significant at the 10%.

Table 5. Impacts of Refugee Camps on Adult and Household Welfare

	(1)	(2)	(3)	(4)
A. Wealth				
	Wealth Index	Service Access	Adequate Shelter Materials	Share of Total Assets
SID	-0.103	-0.012	0.001	0.006
	(0.147)	(0.016)	(0.009)	(0.006)
FDR q-values	[1.00]	[1.00]	[1.00]	[1.00]
R-squared	0.108	0.048	0.036	0.057
Observations	9,264	13,701	13,701	13,701
B. Income and Expenditures				
	Total Income (Log)	Total Expenditures (Log)	Non-food Expenditures (Log)	Food Expenditures (Log)
SID	-0.031	-0.020	-0.021	-0.020
	(0.051)	(0.037)	(0.038)	(0.047)
FDR q-values	[1.00]	[1.00]	[1.00]	[1.00]
R-squared	0.132	0.122	0.111	0.081
Observations	9,068	9,436	9,376	9,430
C. Food Consumption				
	Food Variety Consumption (Share of Products)	Self-Produced Food (Share of products)	Humanitarian Food Aid (Share of Products)	Gift or Barter Food (Share of Products)
SID	0.010	-0.009	0.083***	-0.005
	(0.005)	(0.025)	(0.008)	(0.003)
FDR q-values	[0.101]	[0.225]	[0.001]	[0.101]
R-squared	0.014	0.022	0.086	0.004
Observations	9,438	9,438	9,438	9,438
D. Assistance				
	Received Vouchers or Cash and In-Kind Assistance	Received Food in Kind	Received Assistance to Access Basic Services	Received Assistance for Household Items
SID	0.037	0.055**	0.014	0.106**
	(0.052)	(0.017)	(0.013)	(0.028)
FDR q-values	[0.345]	[0.036]	[0.294]	[0.036]
R-squared	0.021	0.028	0.010	0.127
Observations	1,005	3,017	5,679	3,156
Outcome Level	Household	Household	Household	Household

Notes: The table presents results from equation 3. SID represents standardized values of the inverse weighted distance from the respondent's household location to the camps. Dependent variables are available only for the 2019 wave and are explained in detail in Appendix B. Panel A depicts the wealth dimension, which includes a wealth index and its three main dimensions: service access, shelter materials, and share of total assets. Panel B presents the income and expenditures dimensions, including total household income, food expenditures, and non-food expenditures. Panel C presents the average number of distinct food products consumed by households over the past seven days and the specific way in which the households acquired those food products. Panel D shows the assistance dimensions, with indicator variables set to one indicating the source of assistance. Estimates control for individual characteristics including male=1, age, household size in 2019, household head=1, married=1, and household income sufficiency in 2017 (corresponding to retrospective information before the Rohingya influx). Clustered standard errors at the *upazila* (subdistrict) district are presented in parentheses, and False Discovery Rate (FDR) q-values are reported in brackets. Significance levels: *** at 1%, ** at 5%, * at 10%.

Table 6. Impacts of Proximity to Refugee Camps on Labor Market Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)
A. Labor Market						
	Labor Force	Employed [=1]	Monthly Wage (Sin*)	Weekly Hours Worked (Sin*)	Written Contract [Yes=1]	–
SID	0.002	-0.001	0.020	0.061	0.046***	–
	(0.003)	(0.003)	(0.032)	(0.057)	(0.005)	–
FDR q-values	[1.00]	[1.00]	[1.00]	[1.00]	[0.001]	–
R-squared	0.066	0.031	0.027	0.079	0.033	–
Observations	10,989	6,915	6,913	6,889	1,620	–
B. Type of Job Providers						
	Work for a Government Organization	Work for a Private Company	Work for an NGO	Work for a Household	Work on Self-employed	Work for a Mill
SID	-0.002	-0.019**	0.080***	-0.018**	-0.029**	-0.012**
	(0.004)	(0.005)	(0.009)	(0.006)	(0.009)	(0.003)
FDR q-values	[0.141]	[0.024]	[0.001]	[0.029]	[0.029]	[0.024]
R-squared	0.016	0.013	0.099	0.029	0.032	0.013
Observations	1,857	1,857	1,857	1,857	1,857	1,857
Outcome Level	Individual	Individual	Individual	Individual	Individual	Individual

Notes: The table presents results from equation 3. SID represents standardized values of the inverse weighted distance from the respondent's household location to refugee camps. Dependent variables are available for the 2019 and 2023 waves, with detailed explanations provided in Appendix B. In Panel A, the dependent variables include:(i) Labor Force, defined as all individuals aged 14 to 60 years categorized as employed or unemployed; (ii) Employed, indicating if respondents worked for remuneration for at least one hour in the last seven days; (iii) Monthly wage, represented by the inverse hyperbolic sine transformation of reported last wage payment in Takas; (iv) Weekly hours, represented by the inverse hyperbolic sine transformation of reported average weekly work hours; and (v) Written contract, indicating the presence of a written contract. Panel B delineates the type of work provider, with variables (i) to (vi) corresponding to an indicator set to one if respondents have worked for wages or payment (either in cash or in-kind) for the cited providers. (Sin*) represents the inverse hyperbolic sine transformation, interpretable as a logarithm transformation. Estimates control for individual characteristics including male=1, age, household size in 2019, household head=1, married=1, and household income sufficiency in 2017. Wave fixed effects are included and clustered standard errors at the *upazila* (subdistrict) level are presented in parentheses, and False Discovery Rate (FDR) q-values are reported in brackets. Significance levels: *** at 1%, ** at 5%, * at 10%.

Table 7. Impacts of Proximity to Refugee Camps on Health Outcomes

	(1)	(2)	(3)	(4)
A. Likelihood of Symptoms of Viral Diseases				
Indicator Variables	Diarrhea last month	Fever last month	Cough last month	—
SID	0.021*	0.037**	0.027**	–
	(0.014)	(0.011)	(0.007)	–
FDR q-values	[0.062]	[0.019]	[0.019]	–
R-squared	0.013	0.017	0.025	–
Observations	1,831	3,341	2,187	–
B. Type of Health Provider				
Indicator Variables	UN	NGO	Privately run	Religious group
SID	0.002	0.017**	-0.016	-0.000
	(0.001)	(0.004)	(0.010)	(0.001)
FDR q-values	[0.323]	[0.021]	[0.323]	[0.483]
R-squared	0.001	0.026	0.017	0.006
Observations	6,916	6,916	6,916	6,916
C. Perceptions of Health Services				
Indicator Variables	Improved overall health care	Improved health care treatments	Improved health care safety	Improved health care accessibility
SID	0.003	0.012	0.014	0.001
	(0.006)	(0.008)	(0.010)	(0.007)
FDR q-values	[0.846]	[0.846]	[0.846]	[0.846]
R-squared	0.003	0.006	0.004	0.005
Observations	4,301	2,925	2,358	3,074
Outcome Level	Individual	Individual	Individual	Individual

Notes: The table presents results from equation 3. SID represents standardized values of the inverse weighted distance from the respondent's household location to refugee camps. Dependent variables from Panels A and B are available for the 2019 and 2023 waves, while Panel C variables are available only for the 2019 wave. Detailed explanations for the construction of dependent variables are provided in Appendix B. Panel A includes indicator variables for (i) Diarrhea, (ii) Fever, and (iii) Cough reported by respondents in the last month. Panel B indicates the entity running the health care provider visited by respondents in the last month. Panel C includes indicators for (i) Improved overall health care compared to before July 2017, (ii) Better treatment by staff and users, (iii) Safer health care, and (iv) Easier access to health care. Estimates control for individual characteristics including male=1, age, household size in 2019, household head=1, married=1, and household income sufficiency in 2017. Wave fixed effects are included and clustered standard errors at the *upazila* (subdistrict) level are presented in parentheses, and False Discovery Rate (FDR) q-values are reported in brackets. Significance levels: *** at 1%, ** at 5%, * at 10%.

Table 8. Impacts of Proximity to Refugee Camps on Education Outcomes

Indicator Variables	Student	Primary Education	Junior Secondary Education	Secondary Education	Higher Secondary Education	Post-graduate Education
	(1)	(2)	(3)	(4)	(5)	(6)
SID	0.001	0.004	-0.019	-0.011	-0.001	-0.002
	(0.018)	(0.011)	(0.031)	(0.022)	(0.007)	(0.002)
FDR q-values	[1.00]	[1.00]	[1.00]	[1.00]	[1.00]	[1.00]
R-squared	0.260	0.023	0.033	0.031	0.008	0.019
Observations	6,142	389	1,151	723	762	2,662
Outcome Level	Individual	Individual	Individual	Individual	Individual	Individual

Notes: The table presents results from equation 3. SID represents standardized values of the inverse weighted distance from the respondent's household location to refugee camps. Dependent variables are available for the 2019 and 2023 waves, with detailed explanations for their construction provided in Appendix B. The dependent variable (i) Student is an indicator set to one if the respondent reports currently attending school and is aged between 3 and 25 years old. Variables (ii) to (vi) correspond to indicator variables representing the level of education completed by respondents within each defined age range. Estimates control for individual characteristics including male=1, age, household size in 2019, household head=1, married=1, and household income sufficiency in 2017. Wave fixed effects are included and clustered standard errors at the *upazila* (subdistrict) level are presented in parentheses, and False Discovery Rate (FDR) q-values are reported in brackets. Significance levels: *** at 1%, ** at 5%, * at 10%.

Table 9. Impacts of Proximity to Refugee Camps on Safety Perceptions

Indicator Variables	Experienced or Witnessed					
	Serious Injury	Combat Situation	Rape or sexual abuse	Being close to death	Murder of family or friend	Murder of stranger
	(1)	(2)	(3)	(4)	(5)	(6)
SID	0.026***	0.021**	0.000	0.011**	0.001	0.011**
	(0.004)	(0.006)	(0.001)	(0.003)	(0.001)	(0.003)
FDR q-values	[0.007]	[0.026]	[0.424]	[0.027]	[0.144]	[0.027]
R-squared	0.028	0.027	0.007	0.013	0.006	0.015
Observations	13,701	13,701	13,701	13,701	13,701	13,701
Outcome Level	Individual	Individual	Individual	Individual	Individual	Individual

Notes: The table presents results from equation 3. SID represents standardized values of the inverse weighted distance from the respondent's household location to refugee camps. Dependent variables are available for the 2019 and 2023 waves, with detailed explanations for their construction provided in Appendix B. Dependent variables (i) to (vi) are indicators set to one if the respondent has experienced or witnessed the corresponding criminal event as cited. Estimates control for individual characteristics including male=1, age, household size in 2019, household head=1, married=1, and household income sufficiency in 2017. Wave fixed effects are included and clustered standard errors at the *upazila* (subdistrict) level are presented in parentheses, and False Discovery Rate (FDR) q-values are reported in brackets. Significance levels: *** at 1%, ** at 5%, * at 10%.

Table 10. Impacts of Proximity to Refugee Camps on Hosts' Attitudes Toward Rohingya

Indicator Variables	My family benefited from Rohingya presence	Rohingya presence negatively impacts neighborhood safety	Rohingya should live exclusively in camps	Rohingya families are poorer than local vulnerable families	Rohingya basic needs should just be covered by external entities
	(1)	(2)	(3)	(4)	(5)
SID	0.058**	0.048***	0.003	-0.030	-0.029**
	(0.013)	(0.007)	(0.002)	(0.037)	(0.012)
FDR q-values	[0.011]	[0.006]	[0.135]	[0.223]	[0.052]
R-squared	0.035	0.013	0.002	0.009	0.009
Observations	3,301	3,703	3,703	3,703	3,703
Outcome Level	Household	Household	Household	Household	Household

Notes: The table presents results from equation 3. SID represents standardized values of the inverse weighted distance from the respondent's household location to refugee camps. Dependent variables are available for the 2023 wave, with detailed explanations for their construction provided in Appendix B. Dependent variables (i) to (v) are indicators set to one if the respondent agrees with the statement enunciated in each of the columns. Estimates control for individual characteristics including male=1, age, household size in 2019, household head=1, married=1, and household income sufficiency in 2017. Clustered standard errors at the *upazila* (subdistrict) level are presented in parentheses, and False Discovery Rate (FDR) q-values are reported in brackets. Significance levels: *** at 1%, ** at 5%, * at 10%.

Contents

A Heterogeneous Effects

Table A.1. Heterogeneous effects on Safety-related Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)
A. Heterogeneous Effects by Wealth Index						
	Experienced or witnessed					
Indicator Variables	Serious Injury	Combat Situation	Rape or sexual abuse	Being close to death	Murder of family or friend	Murder of stranger
SID × I(High Wealth)	-0.019**	-0.000	0.001	-0.009	-0.001	-0.013**
	(0.008)	(0.007)	(0.003)	(0.011)	(0.003)	(0.004)
SID	0.037***	0.021*	-0.000	0.016	0.002	0.018***
	(0.005)	(0.009)	(0.002)	(0.009)	(0.001)	(0.001)
I(High Wealth)	0.002	-0.000	0.008**	0.002	0.008*	-0.000
	(0.006)	(0.002)	(0.003)	(0.007)	(0.004)	(0.004)
R-squared	0.028	0.027	0.008	0.013	0.006	0.016
Observations	13,605	13,605	13,605	13,605	13,605	13,605
B. Heterogeneous Effects by Gender						
SID × I(Male)	0.015**	0.006*	-0.003	0.004	-0.001	-0.002
	(0.004)	(0.003)	(0.002)	(0.003)	(0.001)	(0.002)
SID	0.019***	0.018***	0.001	0.009*	0.002	0.012**
	(0.004)	(0.004)	(0.001)	(0.004)	(0.002)	(0.003)
I(Male)	0.009	0.008	0.001	-0.004	0.003	0.006
	(0.011)	(0.005)	(0.003)	(0.005)	(0.004)	(0.004)
R-squared	0.028	0.027	0.007	0.013	0.006	0.015
Observations	13,701	13,701	13,701	13,701	13,701	13,701
C. Heterogeneous Effects by Age						
SID × I(Young)	0.0003**	0.0006***	0.0002**	0.0001	0.0001**	0.0001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SID	0.0161**	0.0008	-0.0064*	0.0072*	-0.0026	0.0064*
	(0.007)	(0.004)	(0.003)	(0.003)	(0.002)	(0.003)
I(Young)	0.0313**	0.0289***	0.0059	0.0146	0.0043	0.0066**
	(0.009)	(0.006)	(0.004)	(0.008)	(0.005)	(0.002)
R-squared	0.029	0.028	0.008	0.013	0.006	0.015
Observations	13,701	13,701	13,701	13,701	13,701	13,701

Notes: The table presents results from equation 3 with estimates examining the interaction between SID and indicator variables of wealth, gender, and age. SID represents standardized values of the inverse distance from surveyor households to refugee camps. The estimates incorporate population weights. Dependent variables are available for both the 2019 and 2023 waves, and detailed explanations for their construction are provided in Appendix B. Panel A illustrates the heterogeneous effects for high wealth, where $I(High\ Wealth)$ is an indicator set to one if the respondent's wealth asset index exceeds the median of the overall sample. Panel B presents the heterogeneous effects for male respondents, where $I(Male)$ is an indicator variable set to one if the respondent's gender is male. Panel C showcases the heterogeneous effects for age, with $I(Young)$ as an indicator set to one if the respondent is between 0 and 23 years old. Estimates control for individual characteristics including male=1, age, household size in 2019, household head=1, married=1, and household income sufficiency in 2017. Wave fixed effects are included and clustered standard errors at the upazila level (i.e., subdistrict) are presented in parentheses. Significance levels: *** at 1%, ** at 5%, * at 10%.

Table A.2. Heterogeneous effects on the Prevalence of Viral Diseases

	(1)	(2)	(3)
A. Heterogeneous Effects by Wealth Index			
Indicator Variables	Diarrhea last month	Fever last month	Cough last month
SID × I(High Wealth)	0.000	0.012	0.010
	(0.021)	(0.015)	(0.016)
SID	0.021	0.029	0.021
	(0.025)	(0.018)	(0.015)
I(High Wealth)	-0.016*	-0.051**	-0.006
	(0.007)	(0.017)	(0.018)
R-squared	0.014	0.018	0.025
Observations	1,817	3,320	2,174
B. Heterogeneous Effects by Gender			
SID × I(Male)	0.010	-0.008	0.012
	(0.008)	(0.012)	(0.011)
SID	0.016	0.042***	0.021**
	(0.011)	(0.009)	(0.008)
I(Male)	0.008	-0.020	-0.035
	(0.014)	(0.025)	(0.018)
R-squared	0.013	0.017	0.025
Observations	1,831	3,341	2,187
C. Heterogeneous Effects by Age			
SID × I(Young)	-0.000	-0.001*	-0.001
	(0.000)	(0.000)	(0.001)
SID	0.024	0.056***	0.052**
	(0.016)	(0.011)	(0.018)
I(Young)	-0.001	-0.038	-0.058
	(0.024)	(0.041)	(0.036)
R-squared	0.013	0.017	0.021
Observations	1,831	3,341	2,187

Notes: The table presents results from equation 3 with estimates examining the interaction between SID and indicator variables of wealth, gender, and age. SID represents standardized values of the inverse distance from surveyor households to refugee camps. The estimates incorporate population weights. Dependent variables are available for the 2019 wave, and detailed explanations for their construction are provided in Appendix B. Panel A illustrates the heterogeneous effects for high wealth, where $I(High\ Wealth)$ is an indicator set to one if the respondent's wealth asset index exceeds the median of the overall sample. Panel B presents the heterogeneous effects for male respondents, where $I(Male)$ is an indicator variable set to one if the respondent's gender is male. Panel C showcases the heterogeneous effects for age, with $I(Young)$ as an indicator set to one if the respondent is between 0 and 23 years old. Estimates control for individual characteristics including male=1, age, household size in 2019, household head=1, married=1, and household income sufficiency in 2017. Wave fixed effects are included and clustered standard errors at the upazila level (i.e., subdistrict) are presented in parentheses. Significance levels: *** at 1%, ** at 5%, * at 10%.

Table A.3. Heterogeneous effects on Host Attitudes Toward Rohingya Refugees

	(1)	(2)	(3)	(4)	(5)
A. Heterogeneous Effects by Wealth Index					
	My family benefited from Rohingya presence	Rohingyas presence negatively impacts neighborhood safety	Rohingyas should live exclusively in camps	Rohingyas families are poorer than local vulnerable families	Rohingyas basic needs should just be covered by external entities
SID × I(High Wealth)	0.001	0.016	-0.009**	0.008	-0.035***
	(0.026)	(0.012)	(0.003)	(0.014)	(0.008)
SID	0.056*	0.040***	0.007**	-0.034	-0.011
	(0.025)	(0.008)	(0.003)	(0.041)	(0.014)
I(High Wealth)	0.010	0.027	0.005	0.030	0.007
	(0.008)	(0.015)	(0.004)	(0.017)	(0.008)
R-squared	0.034	0.014	0.003	0.011	0.012
Observations	3,276	3,674	3,674	3,674	3,674
height *B. Heterogeneous Effects by Gender*					
SID × I(Male)	0.004	-0.001	-0.006*	0.017*	-0.008
	(0.006)	(0.007)	(0.003)	(0.007)	(0.010)
SID	0.056***	0.049***	0.006*	-0.038	-0.025**
	(0.012)	(0.008)	(0.003)	(0.036)	(0.007)
I(Male)	0.002	0.036*	0.004	0.044**	0.000
	(0.017)	(0.015)	(0.009)	(0.015)	(0.011)
R-squared	0.035	0.013	0.002	0.010	0.009
Observations	3,301	3,703	3,703	3,703	3,703
C. Heterogeneous Effects by Age					
SID × I(Young)	0.001	-0.000	-0.000	-0.001	-0.001**
	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)
SID	0.035**	0.053**	0.008	0.006	-0.002
	(0.010)	(0.019)	(0.004)	(0.017)	(0.014)
I(Young)	0.008	-0.035**	-0.009	0.004	-0.054***
	(0.017)	(0.013)	(0.012)	(0.012)	(0.012)
R-squared	0.036	0.014	0.002	0.006	0.011
Observations	3,301	3,703	3,703	3,703	3,703

Notes: The table presents results from equation 3 with estimates examining the interaction between SID and indicator variables of wealth, gender, and age. SID represents standardized values of the inverse distance from surveyor households to refugee camps. The estimates incorporate population weights. Dependent variables are available for the 2023 wave, and detailed explanations for their construction are provided in Appendix B. Panel A illustrates the heterogeneous effects for high wealth, where $I(High\ Wealth)$ is an indicator set to one if the respondent's wealth asset index exceeds the median of the overall sample. Panel B presents the heterogeneous effects for male respondents, where $I(Male)$ is an indicator variable set to one if the respondent's gender is male. Panel C showcases the heterogeneous effects for age, with $I(Young)$ as an indicator set to one if the respondent is between 0 and 23 years old. Estimates control for individual characteristics including male=1, age, household size in 2019, household head=1, married=1, and household income sufficiency in 2017. Wave fixed effects are included and clustered standard errors at the upazila level (i.e., subdistrict) are presented in parentheses. Significance levels: *** at 1%, ** at 5%, * at 10%.

B Outcome Variables Description

The analysis centers on the following outcome families:

A. ECONOMIC OUTCOMES

1. *Wealth:*

   - Wealth Index: The wealth index is a composite measure of a household's cumulative living standard, constructed using principal components analysis (PCA). This methodology assigns weight, as a factor score, to each asset variable considered in the analysis. The measurement incorporates variables such as household size, the share of members per household room, access to household services, materials used for housing construction, and household ownership of selected assets. Below, each dimension is explained.
   - Service access is calculated as the average of the following indicator variables: whether the household has electricity, whether the household has electricity from a public network, whether the household has a private toilet facility, and whether the household does not have to share its drinking water supply.
   - Adequate Shelter Materials are calculated as the average of the following indicator variables: whether the dwelling wall materials are made from brick, cement, mud, or unburnt brick; whether the roof is made from brick, cement, or CI sheet; whether the dwelling has permanent sanitary or latrine facilities; whether it has gas or a cookstove; and whether it has a separate kitchen.
   - Share of Total Assets is calculated as the average of the following indicator variables indicating if the household currently possesses the following assets: residential land, land for agriculture, own dwelling, TV, refrigerator, fan, gas stove, furniture, cell phone, solar panel, bicycle, vehicles, crop inventory, livestock (goats, cows, poultry), unpowered and powered agricultural equipment, fishing nets, boats, business assets, place of business, and cash, jewelry, and savings.

2. *Income and Expenditures:*

   - Total Income (Log): This variable represents the natural logarithm of the total income received in the previous month, denominated in Takas. This income encompasses earnings from various sources including wages, cultivation (including for self-production consumption), livestock, fishing and forestry (including for self-consumption), other business earnings, remittances, asset earn-

ings, pensions, and government cash assistance.

- Total Expenditures (Log): This variable represents the natural logarithm of the sum of non-food and food expenditures incurred by the household in the previous month, also denominated in Takas.
- Non-food Expenditures (Log): This variable represents the natural logarithm of the total household expenditures in the previous month, excluding expenses related to food items. These expenditures cover a range of products including cosmetics and personal care products, household supplies and cleaning products, fuels and lubricants for personal vehicles, and passenger transport by road or railway.
- Food Expenditures (Log): This variable represents the natural logarithm of the total household expenditures in the previous month, specifically allocated to 132 products categorized under various food groups. These categories include food grains and cereals, pulses and lentils, edible oil, leafy vegetables, vegetables, meat, fish, eggs and dairy, fruits, drinks and beverages, spices, miscellaneous food items, prepared food from outside, and tobacco.

3. *Food Consumption:*

- Food Variety Consumption (Share of Products): This metric represents the average number of distinct food products consumed by households over the past seven days. It encompasses a comprehensive array of 132 products categorized into food grains and cereals, pulses and lentils, edible oil, leafy vegetables, vegetables, meat, fish, eggs and dairy, fruits, drinks and beverages, spices, miscellaneous food items, prepared food from outside, and tobacco.
- Self-Produced Food (Share of Products): This figure denotes the average proportion of household consumption derived from self-produced items. It mirrors the aforementioned 132-item assortment.
- Humanitarian Food Aid (Share of Products): This metric signifies the average portion of food products received by households through humanitarian assistance efforts. It mirrors the same 132-item selection outlined earlier.
- Gift or Barter Food (Share of Products): This indicator reflects the average quantity of food products acquired by households through gifting, bartering, or wage-in-kind arrangements. It encompasses the same 132 items detailed above.

4. *Assistance:*

    - Received Vouchers, Cash, or In-Kind Assistance: This indicator variable is set to 1 if the household has received assistance in the form of WFP-provided food, vouchers, SIM cards, or cash.
    - Received Food In-Kind: This indicator variable is set to 1 if the household has received essential food items such as rice, cookies, cereals, pulses, oil, spices, condiments, milk, or dairy products directly.
    - Received Assistance for Accessing Basic Services: This indicator variable is set to 1 if the household has received support aimed at facilitating access to crucial services such as rent or shelter assistance, health care, education, drinking water, sanitation, and solid waste services.
    - Received Assistance for Household Items: This indicator variable is set to 1 if the household has received support to obtain essential household items including cooking fuel, cooking utensils, tarps, bamboo, buckets, clothing, bedding, and personal hygiene products.

B. Labor Market Outcomes

5. *Labor Market:*

    - Labor Force: Defined as all individuals aged 14 to 60 years who are categorized as either employed or unemployed.
    - Employed: An indicator set to one if respondents have worked for remuneration for at least one hour within the past 7 days.
    - Monthly Wage (Sin*): Represents the inverse hyperbolic sine transformation of the reported last wage payment, denominated in Takas currency.
    - Weekly Hours Work (Sin*): Denotes the inverse hyperbolic sine transformation of the reported average weekly work hours.
    - Written Contract: An indicator set to one if the respondent has a written contract in their current job.
    - Unemployed: An indicator set to one if the respondent actively searched for a job within the last month and it is not currently employed.

6. *Type of Job Providers:*

- Work for a Government Organization: An indicator set to one if respondents have worked for wages or payment (either in cash or in-kind) for a government organization.
- Work for a Private Company: An indicator set to one if respondents have worked for wages or payment (either in cash or in-kind) for a private company.
- Work for an NGO: An indicator set to one if respondents have worked for wages or payment (either in cash or in-kind) for an NGO.
- Work for a Household: An indicator set to one if respondents have worked for wages or payment (either in cash or in-kind) for a household.
- Work for a Self-Employer: An indicator set to one if respondents have worked for wages or payment (either in cash or in-kind) for a sole proprietor, owner, employer, or landowner.
- Work for a Mill: An indicator set to one if respondents have worked for wages or payment (either in cash or in-kind) for a public or private mill or factory.

C. Health

7. *Likelihood of Symptoms of Viral Diseases:*
    - Diarrhea last month: An indicator set to one if respondents suffered from diarrhea during the past four weeks.
    - Fever last month: An indicator set to one if respondents suffered from fever, cold, or flu during the past four weeks.
    - Cough last month: An indicator set to one if respondents suffered from a cough during the past four weeks.
8. *Type of Health Provider:*
    - UN: An indicator set to one if the respondent sought health care from a provider affiliated with the United Nations.
    - NGO: An indicator set to one if the respondent sought health care from a provider affiliated with an NGO or non-religious charity group.
    - Privately-Run: An indicator set to one if the respondent sought health care from a privately-run provider.

- Religious Group: An indicator set to one if the respondent sought health care from a provider affiliated with a religious group or religious charity.

9. *Perceptions on Health Services:*

   - Improved Overall Health Care: An indicator set to one if the respondent reports that their overall health has improved compared to before July 2017 (pre-migration).
   - Improved Health Care Treatments: An indicator set to one if the respondent reports that their health has improved compared to before July 2017 (pre-migration) due to receiving better treatment from staff and other users.
   - Improved Health Care Safety: An indicator set to one if the respondent reports that their health has improved compared to before July 2017 (pre-migration) due to enhanced safety measures in accessing health care.
   - Improved Health Care Accessibility: An indicator set to one if the respondent reports that their health has improved compared to before July 2017 (pre-migration) because accessing health care has become easier.

D. Education

- Student: An indicator set to one if the respondent reports currently attending school and is aged between 3 and 25 years old.
- Primary Education: An indicator set to one if the respondent reports completing classes 1 through 4, indicating completion of primary education or madrassa education, and is aged between 6 and 10 years old.
- Junior Secondary Education: An indicator set to one if the respondent reports completing classes 6 through 8, indicating completion of junior secondary education, and is aged between 11 and 13 years old.
- Secondary Education: An indicator set to one if the respondent reports completing class 9 or achieving high school completion, and is aged between 14 and 15 years old.
- Higher Secondary Education: An indicator set to one if the respondent reports completing class 11, denoted as higher secondary completion, and vocational education, and is aged between 16 and 17 years old.
- Post-graduate Education: An indicator set to one if the respondent reports

completing nursing, technical, undergraduate, medical, engineering, or post-graduate education, and is aged between 18 and 25 years old.

E. Safety-related

- Serious Injury: An indicator set to one if the respondent has experienced or witnessed a serious injury.
- Combat Situation: An indicator set to one if the respondent has experienced or witnessed a combat situation.
- Rape or Sexual Abuse: An indicator set to one if the respondent has experienced or witnessed rape or sexual abuse.
- Near-Death Experience: An indicator set to one if the respondent has experienced or witnessed being close to death.
- Murder of Family or Friend: An indicator set to one if the respondent has experienced or witnessed the murder of a family member or friend.
- Murder of Stranger(s): An indicator set to one if the respondent has experienced or witnessed the murder of a stranger or strangers.

F. Host Attitudes

- My family benefited from Rohingya presence: An indicator set to one if the respondent's family has benefited from the presence of Rohingyas.
- Rohingyas presence negatively impacts neighborhood safety: An indicator set to one if the respondent agrees with the statement: "The presence of Rohingyas in Cox's Bazar has affected safety levels in my neighborhood."
- Rohingyas should live exclusively in camps: An indicator set to one if the respondent agrees with the statement: "Rohingyas should live exclusively in camps."
- Rohingyas families are poorer than local vulnerable families: An indicator set to one if the respondent agrees with the statement: "Rohingya families are poorer than vulnerable families in Cox's Bazar."
- Rohingyas basic needs should just be covered by external entities: An indicator set to one if the respondent agrees with the statement: "Rohingyas should be assisted in covering their basic needs solely by NGOs, international organizations, and/or foreign governments."

C Robustness Tests

Table C.1. Impacts of Refugee Camps on Local Economic Development
Restricting Sample to Closer and Further Grids Relative to Camps

	Night Light Density		Deforestation	
	[0 to 63]	Sin*	Ha/Km^2	Sin*
	(1)	(2)	(3)	(4)
A. Main Specification				
I(SID) × I(Post 2017)	0.676***	0.470***	0.003***	0.003***
	(0.006)	(0.002)	(0.000)	(0.000)
FDR q-values	[0.001]	[0.001]	[0.001]	[0.001]
Observations	0.679	0.735	0.129	0.131
R-squared	35,880	35,880	26,312	26,312
Mean Dep. Variable	0.732	0.509	0.002	0.002
Controls (All Panels)				
Grid FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Notes: The table presents the results of the main specification outlined in Equation 1 , restricting the sample to grids that are either closer to or further from the camps. The sample includes the 25% of grids that are closest to the camps and the 25% that are furthest from the camps. $\mathrm{I(SID)}$ represents an indicator variable equal to 1 if the grid is closer to the camp, and 0 if it is furthest. $\mathrm{I(Post2017)}$ is an indicator variable with a value of 1 for post-2017, marking the onset of substantial Rohingya inflows to Bangladesh. Dependent variables include: (i) Night light density [0 to 63]: This variable represents the average light density at the grid level, obtained by averaging across pixels at the desired level of aggregation. Values range from 0 (no light) to 63 (maximum light density). (ii) Night light density Sin*: This variable is the inverse hyperbolic sine transformation of the original night light density variable, interpretable as a logarithm transformation. (iii) Deforestation Ha/Km^2: This variable corresponds to landsat images from the Hansen Global Forest Change, focusing on identifying forest loss defined as the transformation of forested areas into non-forested ones due to stand-replacement disturbances. The measure is expressed in hectares per square kilometer. (iv) Deforestation (Sin*): This variable represents the inverse hyperbolic sine transformation of the original deforestation variable, also interpretable as a logarithm transformation. The estimates account for grid and year fixed effects, with clustered standard errors reported at the grid level in parentheses. False Discovery Rate (FDR) q-values are reported in brackets. Significance levels are denoted as follows: *** significant at the 1%, ** significant at the 5%, * significant at the 10%.